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March 1983
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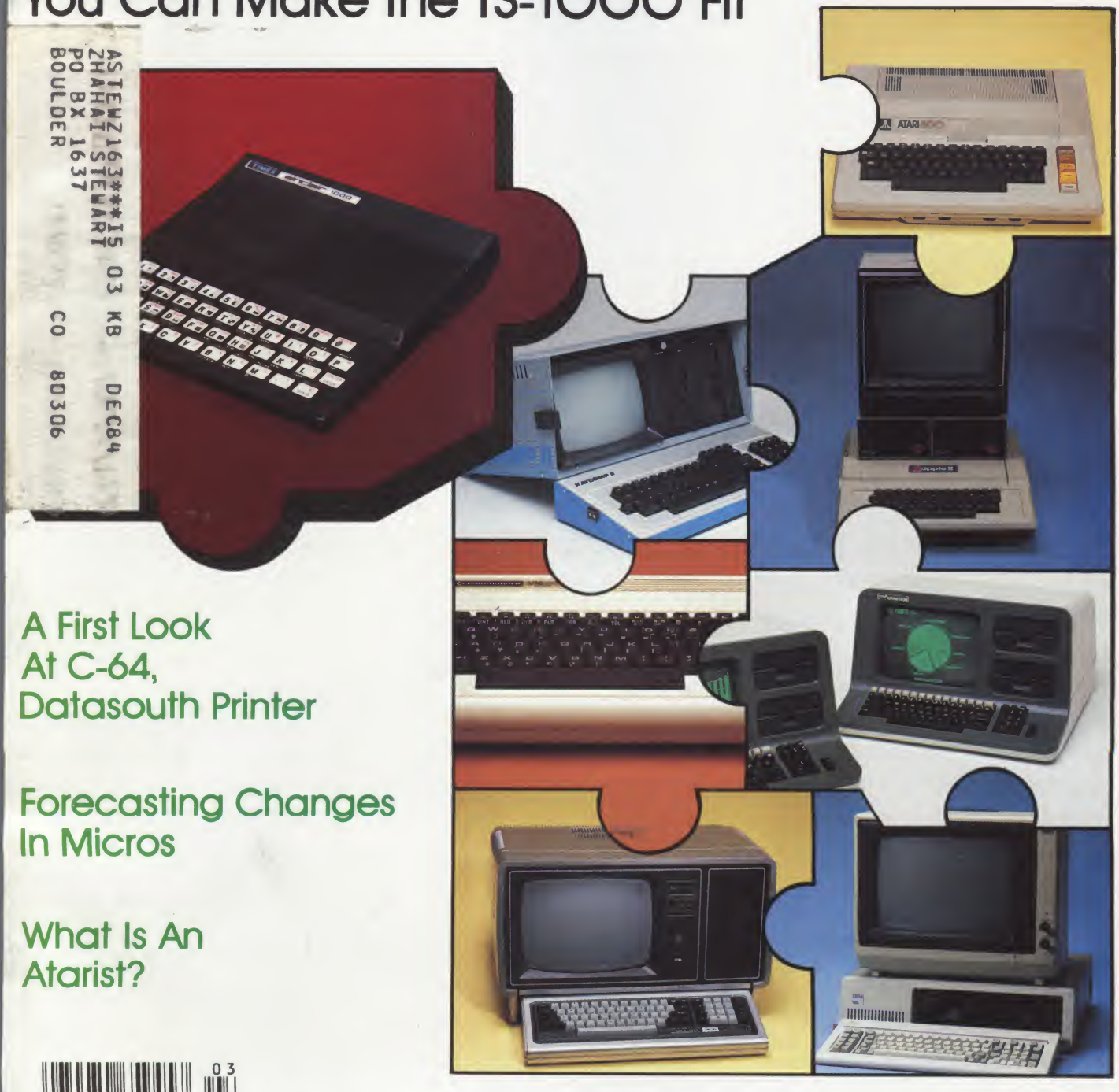

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Cover photos of the Sinclair, Apple, Atari, IBM PC and TRS-80 by Paul Robert Perry.

Cover photo of the VIC-20 by Jonathan Nash.

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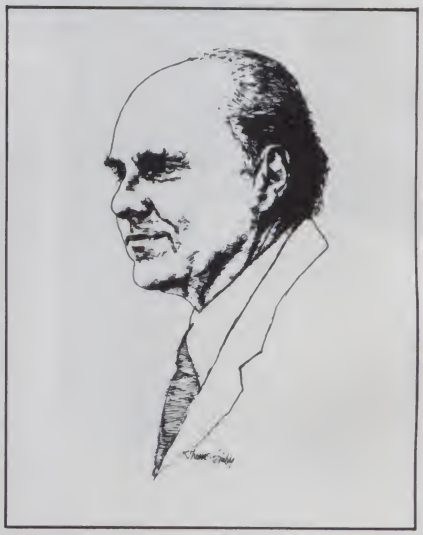
PUBLISHER'S REMARKS

By Wayne Green

Rumblings At Comdex



The PC Debacle

On my way back home from a trip to Asia, I stopped off at Comdex (Las Vegas) to see what was new in the industry, brush up on friendships and get all the gossip. The top subject was the *PC Magazine* disaster.

I've been reading the glowing press stories on the growth of *PC Magazine*. Now that was a wonder, no question about it. Oh, I knew a magazine on the Personal Computer would be successful, but the rapid growth of *PC* surprised even me. But I also knew that they would be in deep trouble as a result. When the growth of a firm—any firm—is too fast, it outstrips the ability of the company to develop skilled workers and management. The lack of a really tight accounting department and collection team means that many bills won't be paid, slowing cash flow.

It was only a question of time—and not much of that—before *PC* would be in very deep trouble and have to sell out to a larger publisher, just as *Byte*, *Creative Computing* and *Personal Computing* did. In that sense, many of the magazines which have appeared as enormous successes have, from a publishing viewpoint, been terrible failures.

In truth, the safest path for a new business of any kind is modest success. This permits the firm to develop the management and work team to cope with growth, without creating any serious cash flow situations.

The inside story of the *PC* crash may eventually come out. From my talks with some of the people involved, I understand that the chap who put up the money for the magazine had given the people working for it the impression that they would share in the success of their efforts. Thus, the employees were reasonably upset when they found that he had sold the magazine to Ziff-Davis, and they were getting nothing out of it.

David Bunnell, who is said to have come up with the idea for the magazine, and the rest of the staff got in touch with Pat McGovern of CW Communications (*Computerworld*, *InfoWorld*, *ISO World*), and the first thing you know there was a *PC World*.

My first reaction, when I heard about the *PC/PC World* hassle, was to announce *PC3* and leap into the fray. But that was more an expression of my puckishess than a practical business prediction. Both Ziff and McGovern have me outclassed when it comes to cash, so who needs that kind of battle? No, we have plenty to do without getting into the middle of a battle between two giants and getting messed up. Oh, I think we could turn out a much better magazine, but sometimes the quality of the product is not a significant factor.

Interestingly enough, when I finally got back to the office after six weeks of traveling all over Asia, I found that quite a few of our people were thinking of the possibility of a new PC magazine too. They were ready to get an issue out in two months, if I'd give the word. With PC add-ons and programs from one end of Comdex to the other, the idea was attractive. And the complaints about *PC*'s lack of coverage in some areas were vigorous at the show.

I looked it over. We are short of the people and space to do it, but we certainly have the enthusiasm and drive to make it go. We know what we need in editorial material, but don't have nearly enough of it on hand to put out the magazine we know should be there. We have the pro-

duction team, the ad sales team, the circulation team and the accounting team to make it go. We'll think about it and watch the Ziff/McGovern fight.

PC Articles Needed

PC owners want to know how to use their system. They want to learn about this in fairly simple language. They want programs they can key in. Despite all of the baloney about the wealth of programs in CP/M, there is pathetically little around to run on the PC. Get cracking on articles for us to publish in *Microcomputing*.

PCers also want to know which of the growing number of add-ons are successful. If you've expanded your PC system, let others know how it has gone for you. Did you have any problems? What have you been able to do with your system? We all need to know about the good and the poor products.

Has anyone worked up some conversions of Basic programs written for the TRS-80 or the Apple so they will grind through the PC?

Computer to Film?

I was trying to solve the basic problem of providing a very low-cost system for storing seldom-needed data. I wanted a system that retrieved data in computer-readable form, but would cost less than using magnetic media.

Well, we're using microfilm and microfiche for visual records storage. It's efficient, inexpensive and can even be stored so that it can be found via a computer index, but the data on the film is not in computer-readable form. Hmmm. What we really need is some way to put computer data directly on film and read it from film back into memory. That would do it.

There's probably a whole technology out there of which I am unaware, but just on the off chance that no one has thought of it yet, I thought I'd write about it and get someone thinking.□

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One of your responsibilities, as a reader of *Microcomputing*, is to help increase the magazine's circulation and advertising, both of which will bring you the same benefit—a larger and even better magazine. You can help by encouraging your friends to subscribe to *Microcomputing*. Remember: Subscriptions are guaranteed—money back if not delighted. So no one can lose. You can also help by filling out the Reader Service card. Answer the questions in the questionnaire and circle the advertisers' Reader Service numbers for more product information. Advertisers put a lot of trust in readers' requests for information.

WHAT'S NEW, BIG BLUE?

By Thomas V. Bonoma

Reexamining Magic Software

And the Latest On Benchmark, VW and PowerText

Getting Personal

This month I'll try to clean up some leftover business from last month's column. I'll continue our review of word processors with one that wasn't available last month and one that has been revised in the interim. I'll also review a few database management programs and present an outstanding program utility (courtesy of its author and the New York Personal Computer Club).

Next month, I hope to spec out beginning, intermediate and advanced hardware systems for those of you in the midst of making (or about to make) purchases. Also in April, I'll start a "Best Software for the PC" list, from which I'll pick the two or three *really* outstanding packages from all those I've evaluated to date.

Mathemagic/Graphmagic

I've spent some time with Mathemagic and Graphmagic for the IBM PC (you can buy both for $159 from International Software Marketing).

These programs, written in compiled Basic (an uncompiled version is available as well) can help you solve a variety of mathematical problems quickly and easily. To use the package effectively, you'll need a disk-based PC, 64K of memory, a color adapter card and monitor (for the graphs) and printer support (optional).

Perhaps the best way to illustrate how the Mathemagic/Graphmagic package works is with an example. Say you're thinking of becoming a software distributor, and you'd like to know how much money you can make at various volumes. Your manufacturer tells you how much you have to pay for a program that retails for $100. If your cost is $60, and you know that dealer margin is computable as DLR.MARGIN = ((RETAILPRICE − MYPRICE)/RETAILPRICE), you can enter that formula to solve some set of "discount prices" you might sell the program for.

Similar computations, of course, could be done with equations for your expected gross revenue, gross profit and net profit in order to compute how many units you'd have to sell to make a profit. All of these formulas are storable on disk and callable by other formulas you define in the future.

No Hassles

For example, a formula for gross profit might be defined as GROSSPROFIT = @GROSS.REV * @DLR.MARGIN. The "@" is a signal to the program that this is a previously-defined formula, and the DLR.MARGIN formula is called in from the disk without fuss or hassle.

Mathemagic is a nice program package that works with reasonable speed in the compiled Basic version, doesn't crash and helps you manage your disks and printer interface.

Once you've saved some file of variable values, like 20 different estimations of DLR.MARGIN at different values of retail price, Graphmagic lets you "call in" this file from disk, reorder or relabel the values, if you'd like, and plot it as a bar, line or pie chart with full control over color, text additions and the like. It even includes the ability to print the graph to a Graftrax-modified IBM printer. You can overlay graphs, call in pictures not generated with Graphmagic and add them to your graphs (like a corporate logo, for instance) and get quick, well-done plots in a short time.

Both Mathemagic and Graphmagic have manuals that, despite being a little short on examples, provide understandable menu command structure.

You should be able to use both packages with only an hour or two of fooling beforehand. These packages are well worth the price if your equipment supports them.

If I could buy only one, it would be Mathemagic, which is more flexible and more developed at this stage than GraphMagic. The latter, for instance, can't handle bivariate data, like trend analyses, easily. And although it is quite useable without Mathemagic (you can construct your own data files easily; a program is provided), it's actually tailored for use with Mathemagic. Mathemagic, on the other hand, is a true stand-alone product.

Word Processing Update

Three things have changed since we looked at word processors last month.

First, I received another entry, The Benchmark ($499.95 from Metasoft Corp., 711 E. Cottonwood Lane, Casa Grande, AZ 85222). Second, Volkswriter version 1.2 has just been sent to all users, and it's very different from version 1.1. Third, I've had a bit more experience with one or two of the processors we reviewed last time, so I'll update you on them.

Breaking out Benchmark

Benchmark 3.0 is a complete word processing and mail list program (The Mail List version 1.0 was sent with Benchmark; I don't know if it's included as part of the standard package). Benchmark also supports some limited-number processing (the system will add or otherwise manipulate columns of numbers in a document), business graphics (you can make tables, page borders and other designs with the PC's line-drawing characters) and foreign language characters.

In addition, Benchmark is a full-featured word processor: headers, footers, keyword "macros" (a keystroke used to type an often-used phrase) and form creation/fill-in for form letters.

The Benchmark is a well-known CP/M program and has been in use for several years on eight-bit systems. The adaptation to the PC was done competently,

Address correspondence to Thomas V. Bonoma, 45 Drum Hill Road, Concord, MA 01742.

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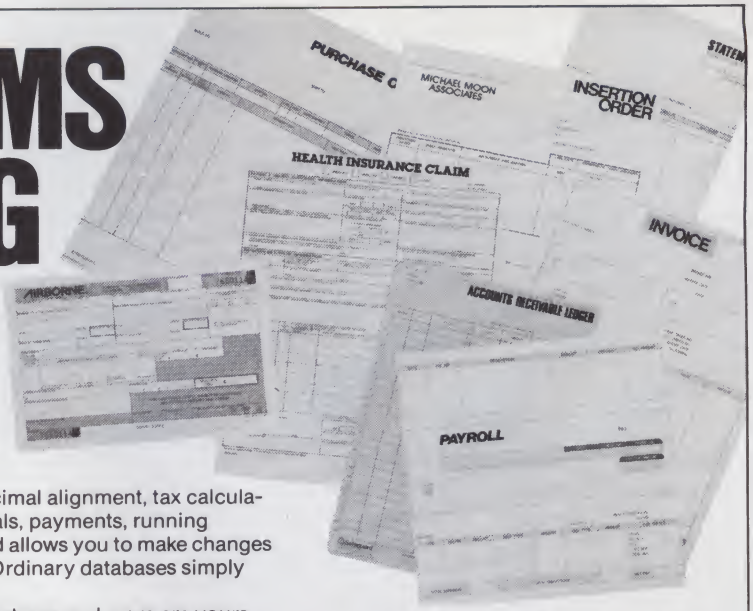
WHY A FORMS PROCESSING DATABASE?



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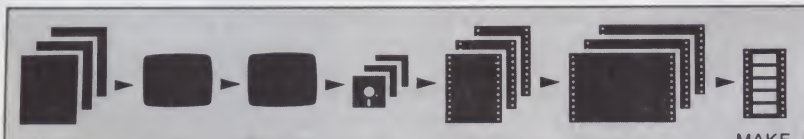

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makes use of the function keys to some degree and works apparently flawlessly from floppies or hard disk.

The installation guide, though, is a murky, poorly-printed document and is hard to follow. Consequently, it is not easy to configure Benchmark 3.0 to your PC/printer, although a wide array of printers/monitors are supported, and the installation has to be done only once. The Benchmark is a good word processing system, possibly a great one, that would merit from a better installation guide and more tutorials and examples in the manual for those of us who need the help.

The Mail List program, by contrast, has excellent documentation and is easier to use and more fully-functioned than comparable ones (like WordStar's "MailMerge"). The Mail List is callable from within Benchmark, and looks like it was custom-coded for the PC. This is one you should look at closely if you have production-level mailing list requirements.

New Version of Volkswriter

Volkswriter version 1.2 has been released and it is just great! VW now supports headers and footers, superscripts, subscripts, conditional page breaks and single-key movement for the cursor in some instances. Copy protection requirements are gone, another big plus, and both a 64K and 128K version of the program are provided for the user (the 128K is not sent until the registration card is received).

Printers supported (the serial port can now be used) include the Epson with and without Graftrax, the "new" NEC Spinwriters (but not 5510s or 5520s), the Prowriter and the Smith-Corona TP-1. Word has it that a Color Prism driver will be available soon.

Best of all, VW 1.2 now supports format files, or one-time layouts of how you want your letters and documents to appear.

With this release, VW is now in the league with the big boys, and I would place it up there with the best of them.

Volkswriter is now in the league with the big boys, and I would place it up there with the best of them.

PowerText

A word on PowerText to add to our review from last month: The more I use this program, the more I like it. It makes the writing of documents, letters and even complicated columnar material or 132-column "landscapes" trivial. Once you've customized it to your printer (and Beaman-Porter is adding many new drivers, like one for the Prism and NEC Spinwriter 5520), all you do is "write and go."

I'm not sure about those PowerText/WordStar comparison ads, because, as I said last month, PowerText and WordStar were intended to do different things. And version 1.8 of PowerText has a couple of bugs, which will be gone when you read this.

Give PowerText serious consideration if you're looking for a word processor.

Three Top-Rate DBMS Programs

This month, we'll look at VersaForm version 1.4, TIM III and EasyFiler, three database-management systems that stand out in a pack.

VersaForm

VersaForm ($389 from Applied Software Technology, 14125 Capri Drive, Los Gatos, CA 95030) is a Pascal-coded "business forms processor" that makes excellent use of the IBM's function keys, is exceptionally well-documented and contains a "hands-on" tutorial that will shorten your learning time.

Since VersaForm uses the widely-acclaimed Network Consulting implementation of UCSD Pascal, it's easy to configure your wide array of peripherals (including a still-to-come hard disk) and expanded memory for system optimization.

Forms design, which can include "one-time" fields (for instance, the client's name) and multiple pages of column data (like service, time spent, fee, amount and balance) is a snap.

The program has a broad and potentially bewildering array of data format, restriction and other options that allow the designer to make sure that *only* the correct data is accepted by the program. Data must be "validated"—that is, checked against the limits you specify—or the program tells the data coder which field is illegal and (usually) why.

You can add a "check digit" to numerical entries, use the built-in calculator to make on-screen computations and perform all sorts of other tricks space doesn't allow me to describe. The report options, including multiple sorts, totaling, subtotaling, print "masks" and features more interesting to more advanced users, are extensive, easy to design and easy to modify.

Nearly Bugless

I've found no bugs in the program, which is supplied on three disks (a program disk, a report disk for temporary storage during sorts and a tutorial disk), except for a missing question mark on one of the prompts. However, there are restrictions on what the program will and won't do (see Table 1).

Still, VersaForm, suited for the small businessperson as well as the hobbyist, is outstanding.

TIM III

When somebody mentions Basic to me in the same breath with DBMS, I tend to get ill. As useful a language as it is, Basic was never intended to perform the kinds of complicated coding jobs required of a professional-level DBMS.

Well, look again, because Total Information Management III version 1.7 *is* coded in Basic, and *is* outstanding as a DBMS. (It's available from Innovative Software, 9300 W. 110 St., Overland Park, KS 66212, for $495.)

You name it and TIM III does it. It includes a user-easy file creation module with extensive sort/select/print capabilities, on-line help (VersaForm has this too—see Table 1), as well as the ability to "import" regular ASCII data files.

TIM is friendly, contains tutorial examples and will run in only 64K of memory. The major disadvantage of TIM is that the file structure is limited to 40 fields of 60 characters maximum each. If you don't use 60 characters in some field, that doesn't "slip" the maximum number of fields—still 40. For many applications, this will be fine, but for others, not enough. (By the way, IS's new graphing package is about to be released; I'll report on that in an upcoming column.)

EasyFiler

EasyFiler, the third in Information Unlimited Software's family of EasyWriter II and EasySpeller, runs in 64K and is compatible with EasyWriter II. And it contains its own text editor in case you don't have that good word processor.

EasyFiler ($400 from IUS, 2401 Marinship Way, Sausalito, CA 94965) is easily comparable, and possibly more extensive, than VersaForm in data-checking and input-formatting abilities: you can specify acceptable sets of characters, data types and so on *ad infinitum*.

The program formats and generates mailing labels from your records automatically, and the report generator is a difficult but unbelievably powerful method of sorting and extracting only the data you want.

Like TIM and VersaForm, EF is menu-driven for ease of choice and configurable to a wide range of printers and hardware (but does not take advantage of extended PC memory). Like its cousin EWII, EF comes on multiple disks—system, reports, extraction, sequencing and housekeeping disks.

The housekeeping disk lets you add Basic data files to the program, change or "remodel" data files or "export" EF data to an unmodified DOS data diskette. EF uses specially-formatted disks, which means that you'll do some disk swapping

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and that you can't support a hard disk right now.

VersaForm, TIM III and Easy Filer: Qualitative Evaluations

VF is my favorite of the three systems covered above because of its professionalism, documentation, speed with the "RAM-disk" function (see Table 1) and extensive input-checking.

However, you're limited to Pascal exportation with the data files, which means, for example, that you can't use VisiPlot. Also, you should be prepared to invest a weekend in learning VF well—it can be confusing at first.

TIM is like a big, friendly dog . . . it does its job well, completely, it's easy to be around and, depending on your application, it's quite enough for most things you could ask it to do.

TIM is like a big, friendly dog . . . it does its job well, completely (and) is easy to be around . . .

DBMS	VF	TIM	EF
Characters per Record	Unlimited	2400	1000
Characters per Field	80	60	255
Fields per Record	Unlimited	40	50
Multiple Disks	No	No	No
Data Validation	Extensive	Type	Extensive
Reports Generation	Extensive	Extensive	Extensive
Import/Export of Data	Pascal	Yes	Yes
Memory Expansion	512K	No	No
Hard Disk Capabilty	Coming	Yes	No
Editor	No	No	Yes
Auto-filling, Repetitive Data	Yes	No	No
Tutorial	Yes	Yes	Yes
Restrictions	1,2*	3,4*	5,6*
Ease of Use	Medium	Easy	Difficult
On-line Help	Yes	Yes	No

**Notes:*

1, 2—When doing a report, VF will not select forms on the basis of its column items. Since these are frequently the ones the user wants "pulled out" selectively, this is a major restriction. Additionally, VF "exports" only to other UCSD Pascal programs, not to Basic.

3, 4—TIM doesn't allow you to "save" characters if any field is shorter than the maximum; you're still limited to 40 fields. And, although it outputs files in WordStar format, TIM doesn't permit the direct generation of form letters.

5, 6—EF requires seven disks and uses a specially formatted disk structure that's not compatible with other DOS disks.

Table 1. Comparison of three DBMS packages.

EF is awesome. It's a bit less friendly (because it's more complicated) than the others, but it works flawlessly and can handle any extraction or input validation job you'd like to throw at it. And it exports and imports to both DOS and EWII with impunity.

Buying a DBMS is difficult and tricky; most experienced users wind up with three or four—and use none of them very often.

Remember that we've covered other DBMS systems, like Condor and The Answer, and that I'll cover more in future columns. Think about what you want the system to do for you before you buy it—and *get a demonstration.*

Quick Reviews

I look at a great deal of software and can review only some of it at length. Generally, I prefer "thematic" reviews, like last month's comparison of word processors, or this month's DBMS coverage.

But that doesn't mean there isn't a lot of fine programming out there that you should be aware of. Short summaries of some of the more recent packages I've seen (and liked enough to write about) follow.

Games

From Datamost (9748 Cozycroft, Chatsworth, CA 91311) comes Pig Pen and Space Strike for the IBM PC (each game is $29.95). Both games work in color as well as monochrome, but are definitely more involving in color.

Pig Pen is a Pac-Man-like game involving a dot-dropping little man and from two to four man-eating pigs. Space Strike is an implementation of Invaders for the PC, with seven user-selectable levels of play.

Both games have stop-action keys; Space Strike has a sound toggle as well. Both games allow the user to employ a standard or custom set of response keys. Space Strike can be configured for a joystick as well.

The animation is good on both games, although the experts at my house say Space Strike is the more engaging of the two offerings.

A pair of nonarcade-type games, Aqua Run and Microcosm, are welcome additions to the software field.

Aqua Run (Soft Spot MicroSystems, PO Box 415, North Canton, CT 06059) is a full-color graphics game depicting a diver who must retrieve treasure from an ocean bottom before running out of air or lives (endangered by biting fish).

Several levels of the game can be played, with the ocean and depth of the treasure expanding in the more expert levels.

If that's too peaceful for you, take a look at Microcosm ($39.95 from Aeon Concepts, 1657 Red Mill Road, Pittsburgh, PA 15241), a kind of super version of the game "Life."

Like the original "Life," Microcosm is based on a simulation of birth, death and migration among populations of microorganisms. Both solitaire and competition modes are available, as is a unique "look ahead" feature that lets you see the consequences of your moves, and a relatively complete disk file of starting patterns that produce interesting population effects over generations.

Both Aqua Run and Microcosm are coded in Basic; Microcosm will run in monochrome as well as color.

Finally, for the human control seekers comes "Lost Colony" (Acorn Software Products, Inc., 1945 Gallows Road, Suite 705, Vienna, VA 22180; $29.95), a complex simulation of a space colony that has been abandoned by earth and must fend for itself until rescue can arrive.

You must allocate economic activity among farming, minerals, energy, manufacturing and transportation. Exploration is necessary to find more raw materials, and you'll have to build plants and manufacture consumer goods to keep the populace happy. Robots must be built, and men and women must be assigned to jobs.

There are 26 pages of documentation that you'll have to read carefully before playing.

If that's not to your liking, how about Micro Football for the PC (Westwood Software, 1670 N.W. Emporer Drive, Corvallis, OR 97330; $29.95)?

A graphics display (of the ball's position and movement only) is included in

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2 8″ double sided drives, 2.4 meg of storage	
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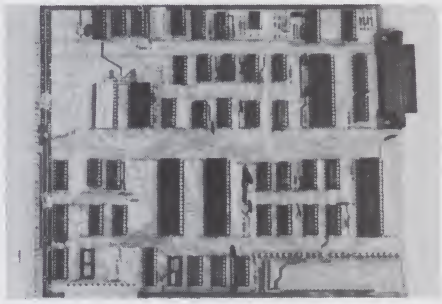

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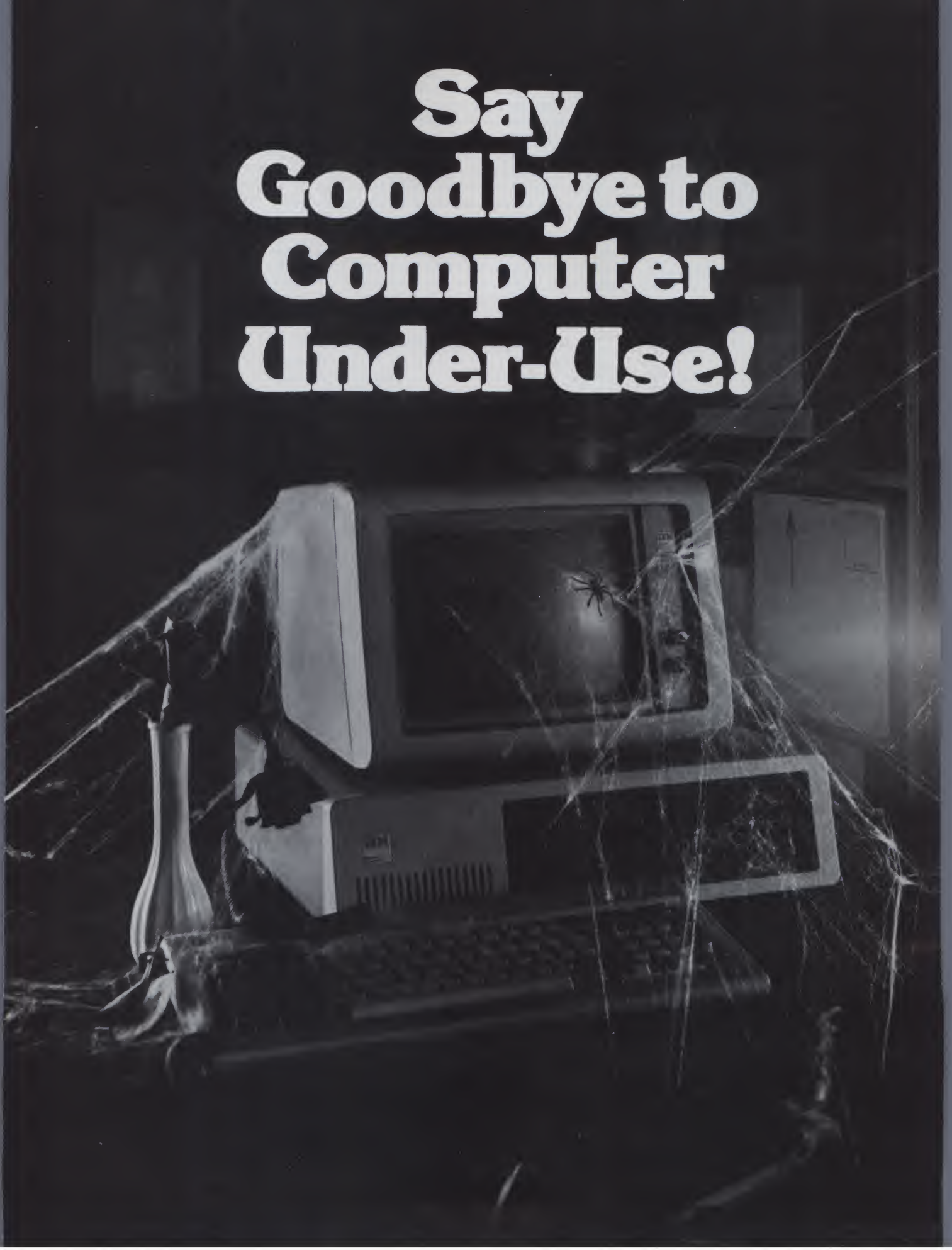

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the Basic program; you choose among menus of kick, pass or run plays. Micro Football is a solitaire game; the computer defends one goal and you the other. There are penalties, runbacks and other realistic happenings, although they are dependent not on your actions but on the program's logic.

The game has toggles for sound, for the color of the field and for exiting. It requires the color graphics adapter and at least 64K of memory. As the documentation says, "Be careful. The PC can beat you." (It beat me.)

Educational Games

From Spinnaker Software (215 First St., Cambridge, MA 01242; $44.95) comes a series of educational games for kids. Included is the Snooper Troops Series of detective adventures with graphics, sound, "case notebooks" and the like.

In case number 2, The Disappearing Dolphin, a dolphin has been purloined (fishloined?), and the Snooper Troops must investigate a variety of potential perpetrators, assimilate clues and learn the geography of Costa Villa. An agent is provided with a SnoopMobile for traveling (the user must drive it with the PC's arrow keys and not run into things, or he'll crash), a wrist radio, a flashlight, a camera, a pencil and, or course, the SnoopNet computer data banks located at Snoop Headquarters.

The agents must brief themselves on their suspects, drive to various locations for interrogation (or for general "snooping") and solve the crime. Costa Villa has a phone system, of course, and different suspects can be reached at different phone numbers. Houses can be broken-and-entered, and agents can be caught if they're not careful!

Case number 2 incorporates professional-looking graphics and requires 64K, the color card, either version of DOS and BasicA. It's a testament to what can be done in Basic programming.

Snooper Troops is designed for ages ten to adult, and involves deductive reasoning skills, note-taking skills, information classification and vocabulary-building.

```
Memory Lister will display the contents of a selected segment of memory in
256 byte blocks per screen.  The contents are displayed in HEXADECIMAL and in
ASCII format.  From the menu, select the segment you wish to examine.

                        U = User selected segment.
                        D = DOS segment of memory.
                        P = This program in memory.
                        R = ROM contents of memory.
                        M = Monochrome screen buffer.
                        E = End program.


                        Please enter your choice :

                         SEGMENT STARTS AT : &H0858
offset                          hexadecimal values                      ASCII code
hex    ]2  3  4  5  ]6  7  8  9  ]A  B  C  D  ]E  F  0  1  ] 23456789ABCDEF01
0F72 =]C1 0F E8 03 ]3A 8F D9 4D ]45 4D 50 45 ]45 4B 2E 42 ] A.h.:YMEMPEEK.B
0F82 =]41 53 20 2D ]20 4A 6F 68 ]6E 20 53 63 ]68 6E 65 6C ] AS - John Schnel
0F92 =]6C 20 2D 20 ]4E 6F 76 2E ]20 31 39 38 ]32 2E 2E 2E ] l - Nov. 1982...
0FA2 =]55 73 65 64 ]20 62 79 20 ]70 65 72 6D ]69 73 73 69 ] Used by permissi
0FB2 =]6F 6E 20 6F ]66 20 4E 2E ]59 2E 50 2E ]43 2E 00 E6 ] on of N.Y.P.C..f
0FC2 =]0F F2 03 3A ]8F D9 20 20 ]41 20 70 72 ]6F 67 72 61 ] .r.:Y  A progra
0FD2 =]6D 20 74 6F ]20 64 69 73 ]70 6C 61 79 ]20 6D 65 6D ] m to display mem
0FE2 =]6F 72 79 00 ]FB 0F FC 03 ]C9 20 DD 20 ]3A 20 BF 20 ] ory.{.|.I ] : ?
0FF2 =]18 2C 20 11 ]20 3A 20 C0 ]00 1D 10 06 ]04 91 20 CE ] .,  . : @..... N
1002 =]0F 19 29 22 ]2A 2A 2A 20 ]4D 65 6D 6F ]72 79 20 4C ] ..)"*** Memory L
1012 =]69 73 74 65 ]72 20 2A 2A ]2A 22 00 29 ]10 10 04 91 ] ister ***".)...
1022 =]20 3A 91 20 ]3A 91 00 7B ]10 1A 04 91 ]22 4D 65 6D ]  : :.{..."Mem
1032 =]6F 72 79 20 ]4C 69 73 74 ]65 72 20 77 ]69 6C 6C 20 ] ory Lister will
1042 =]64 69 73 70 ]6C 61 79 20 ]74 68 65 20 ]63 6F 6E 74 ] display the cont
1052 =]65 6E 74 73 ]20 6F 66 20 ]61 20 73 65 ]6C 65 63 74 ] ents of a select
1062 =]65 64 20 73 ]65 67 6D 65 ]6E 74 20 6F ]66 20 6D 65 ] ed segment of me

  < SPACE-BAR > to continue ---------------------- < M > to return to menu
```

Fig. 1. The initial Memory Lister menu screen (top) and a sample of the program's output when "P" is chosen from the main menu. The "]" characters (below) are vertical bars on the display.

A Memory Utility: MEMPEEK.BAS

Recently I became aware of the New York IBM Personal Computer User's Group, a 500-strong organization (with $10-a-year dues) headed by Joe Rigo (1385 York Ave., New York, NY 10021).

Outside of the normal activities (including group and "neighborhood" meetings and special deals on hardware and software), the group publishes a quality newsletter with software reviews, tips and programs.

In the NYPC's November newsletter was a program, MEMPEEK.BAS, written by John Schnell; Mr. Schnell and the NYPC kindly gave me permission to reprint the program here. It can help you find out a lot about your PC; it's a good (but uncommented) illustration of quality Basic coding. (Refer to Listing 1 and Fig. 1 for the program listing and output samples.)

> MEMPEEK.BAS can help you find out a lot about your PC; it's a good illustration of quality Basic coding.

MEMPEEK allows you to look at *any* part of your PC's memory, as well as the monochrome screen, the disk-operating system memory area, Basic's area or any other you specify. But, to use MEMPEEK, it is helpful to understand some things about your computer's memory.

As Mr. Schnell noted, each memory address, or byte, in your PC can be thought of as a bin; a bin has both a label and contents. The contents is limited to eight bits, or from 0 to 255 in decimal notation (00 to FF in hex, 00000000 to 11111111 in binary; hence, eight *bi*nary digits).

Now for addresses. It is possible to equip your machine so that it has up to 1,048,575 bins (bytes) of memory, although the average system will have 64 × 1024 = 65,536 such bins (didn't know that your 64K machine really has 65K, did you?).

As Mr. Schnell tells us, the address of a memory "bin" is limited to 16 bits, which is to say, from 0 to 65,536 (FFFF in hexadecimal). That, however, doesn't begin to number all the memory bins which can be stuffed into the PC.

If you work the math, you'd find that we need 65,536 × 16 = 1,048,575 addresses, or in hex, FFFFF. Whoops!—that's more than two bytes, but less than three. In fact, it's two and a half bytes. So, your local designers worked out a scheme to address the entire million bytes of memory as follows.

Working it Out

Two values are necessary to define any memory address in the PC: a Segment and an Offset. Defining a segment (DEF SEG—see the Basic manual) uses a two-byte word, as does Offset (when specified).

A Segment can be thought of as an address pointer that can count only in multiples of 16; it's like turning to the first page of each chapter in a book. The Offset tells how many pages "into" that chapter we should go, once we have found it.

So, if we want to look at hexadecimal address FE000 in the computer, we specify Segment (chapter) F000 and Off-

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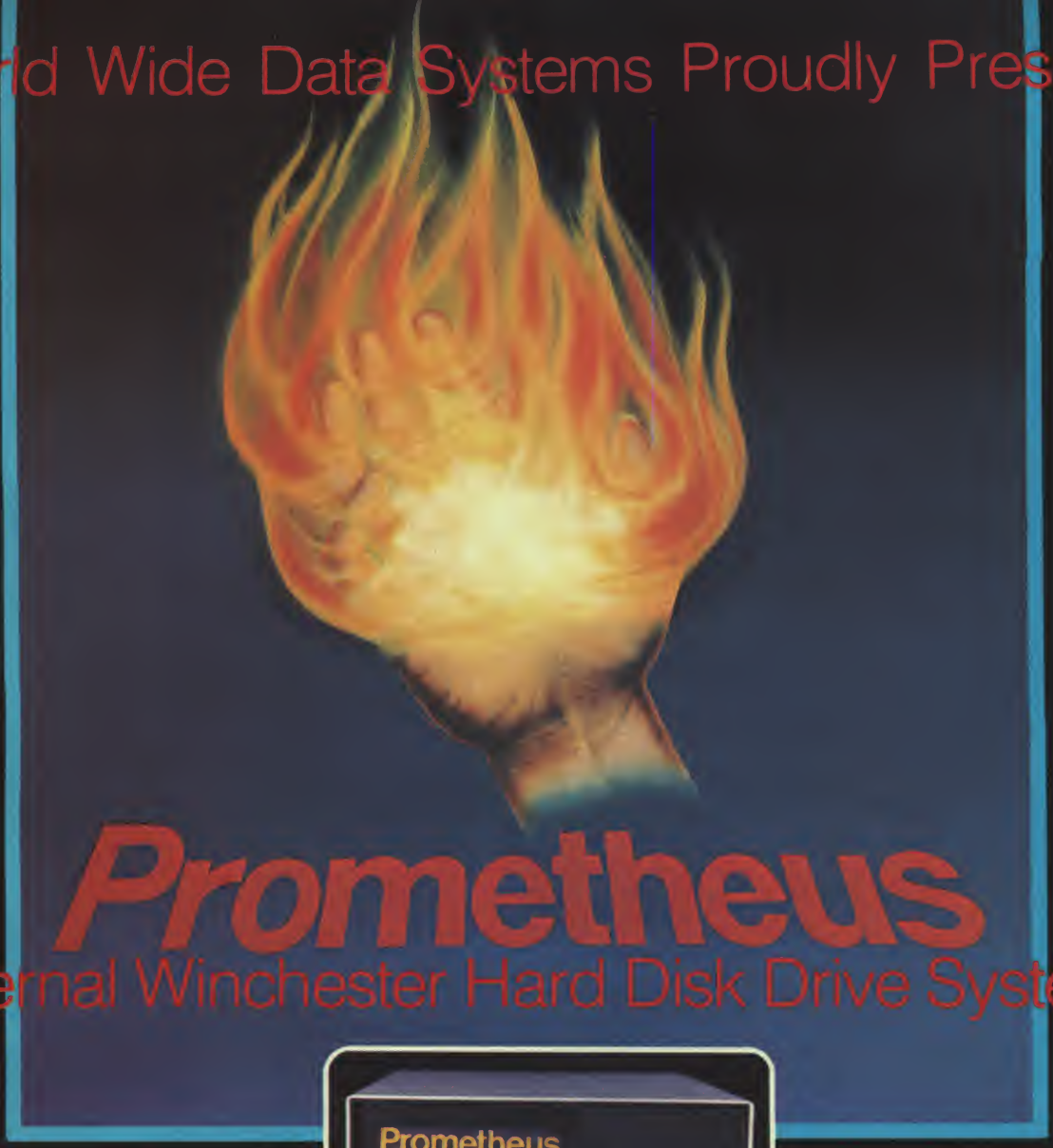

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set E000, and this is what happens:

F000 (The last zero is dropped.)
E000

FE000 (The hexadecimal sum of Segment and Offset.)

Confused? You won't be after you play with the program. MEMPEEK asks for a Segment and Offset you wish to examine. You can also let the program do the choosing for you, and look at DOS, the memory containing MEMPEEK's code itself, the monochrome screen buffer area (where characters to be output to the screen are stored or "mapped") or the PC's built-in read-only memory (ROM). You can learn a great deal about your machine, and can cause it no harm, by mucking around in its innards with this program.

Let's look at Listing 1 to see how Mr. Schnell constructed his code. Lines 1000–1160 do some housekeeping; these lines make up the main menu for the program. There's nothing unusual here, but look at line 1190. It's a good way to test whether the character input (INSTR function) is contained in the valid set "UDPRME." If not (INSTR returns a "0" if the response is not contained in the test pattern), the program beeps and goes back to get a valid response.

Lines 1210–1290 are the user-selected memory examination segment. Lines 1300–1320 set up MEMPEEK for looking at the disk-operating system. Lines 1330–1380 let the program get introspective and look at its own code in memory. Lines 1390–1410 allow examination of ROM, and lines 1420–1440 set up MEMPEEK to look at the video display area (monochrome) at hex B000.

After some display activities, all the menu choices drive to the main loop in the program, which starts at line 1540. It's worth some of your time and your study; it's a good exercise in "nesting" loops to get a repetitive job done.

Loop counts by 16s, just like our Segment counter. After some label printing, Loop1 prints the inverse video line at the top of the screen, tailored to the starting position specified by the user. Then, Loop2 (line 1640) puts up the hexadecimal contents of each address, and Loop3 (line 1700) translates these hexadecimal characters into ASCII code wherever possible. Where it's not possible, a "." is printed.

There's a lot you can do with this program. For example, can you add a menu option that would show the user the color graphics buffer area? (Hint: DEF SEG = &HB800—there are eight 16K "chapters" in the buffer space.) Can you use MEMPEEK to figure out what lines 1170 and 1770 do? Try—the computer's often confusing, I know, especially when it has the audacity to bear its innards to us.

Remember, though, the words of Humpty Dumpty: "The question is, who's to be master, that's all."□

```
1   19:39:40     11-20-1982     B:MEMPEEK.BAS
1000 'MEMPEEK.BAS - John Schnell - Nov. 1982...Used by permission of N.Y.P.C.
1010 '  A program to display memory
1020 KEY OFF : COLOR 7, 0 : CLS
1030 PRINT TAB(25)"*** Memory Lister ***"
1040 PRINT :PRINT :PRINT
1050 PRINT"Memory Lister will display the contents of a selected segment of
     memory in"
1060 PRINT"256 byte blocks per screen.  The contents are displayed in
     HEXADECIMAL and in"
1070 PRINT"ASCII format.  From the menu, select the segment you wish to examine
     ."
1080 PRINT :PRINT
1090 PRINT TAB(25)"U = User selected segment."
1100 PRINT TAB(25)"D = DOS segment of memory."
1110 PRINT TAB(25)"P = This program in memory."
1120 PRINT TAB(25)"R = ROM contents of memory."
1130 PRINT TAB(25)"M = Monochrome screen buffer."
1140 PRINT TAB(25)"E = End program."
1150 PRINT :PRINT :PRINT
1160 PRINT TAB(25)"Please enter your choice : ";
1170 DEF SEG = 0 : POKE 1047, PEEK(1047) OR 64
1180 RESP$ = INPUT$(1)
1190 CHOICE = INSTR("UDPRME", RESP$) : IF CHOICE = 0 THEN BEEP: GOTO 1170
1200 CLS: ON CHOICE GOTO 1210, 1300, 1330, 1390, 1420: GOTO 1830
1210 'user selection
1220 INPUT "Enter start of segment in hexadecimal ( 0000 to FFFF )  : "
     ;SEGMENT$
1230 IF LEN(SEGMENT$)<1 OR LEN(SEGMENT$)>4 THEN BEEP: GOTO 1220
1240 FOR LOOP=1 TO 4: IF MID$(SEGMENT$,LOOP,1)<"0" OR MID$(SEGMENT$,LOOP,1)>"F"
     THEN BEEP: GOTO 1220: ELSE NEXT LOOP
1250 PRINT :PRINT
1260 INPUT "Enter memory offset in hexadecimal ( 0000 to FFFF )  : ";OFFSET$
1270 IF LEN(OFFSET$)<1 OR LEN(OFFSET$)>4 THEN BEEP: GOTO 1260
1280 FOR LOOP=1 TO 4: IF MID$(OFFSET$,LOOP,1)<"0" OR MID$(OFFSET$,LOOP,1)>"F"
     THEN BEEP: GOTO 1260: ELSE NEXT LOOP
1290 LOCATE 19,23: PRINT ">>  User Selected Segment  << ": GOTO 1450
1300 'display of dos
1310 SEGMENT$ = "0000": OFFSET$ ="0000"
1320 LOCATE 19,23: PRINT ">>      Display of DOS     <<": GOTO 1450
1330 'display of program in memory
1340 DEF SEG = 0: BASIC = PEEK(&H510)+PEEK(&H511)*256
1350 DEF SEG: PROGRAM = PEEK(&H30)+PEEK(&H31)*256
1360 SEGMENT$=RIGHT$("0000"+HEX$(BASIC),4)
1370 OFFSET$=RIGHT$("0000"+HEX$(PROGRAM),4)
1380 LOCATE 19,23: PRINT ">>  Display program in Mem.  <<":GOTO 1450
1390 ' beginning of rom in high memory
1400 SEGMENT$="F000":OFFSET$="E000"
1410 LOCATE 19,23: PRINT ">> DISPLAY ROM IN HIGH MEM. <<":GOTO 1450
1420 'monochrome screen buffer
1430 SEGMENT$="B000":OFFSET$="0000"
1440 LOCATE 19,23: PRINT ">> Display Mono Screen Buff. <<"
1450 'push space bar to start
1460 LOCATE 21,1: PRINT TAB(25)"SEGMENT starts at : &H" SEGMENT$
 2   19:39:40     11-20-1982     B:MEMPEEK.BAS
1470             PRINT TAB(25)"OFFSET starts at  : &H" OFFSET$
1480 PRINT :PRINT TAB(25)"Pusb <SPACE-BAR> to start :";
1490 RESP$=INPUT$(1): IF RESP$<>" " THEN BEEP: GOTO 1490
1500 'routine for displaying the contents of memory on the screen
1510 CUR.SEG$= "&H"+SEGMENT$: CUR.OFF$="&H"+OFFSET$
1520 HEXVAL$="0123456789ABCDEF01234567890ABCDE": HEXHEADING = VAL("&H"+RIGHT$
     (OFFSET$,1))+1
1530 LINECOUNT=1: ADDR.FMT$="\  \ =":BYTE.FMT$="\\ "
1540 FOR LOOP=VAL(CUR.OFF$) TO 65336! STEP 16: DEF SEG=VAL(CUR.SEG$)
1550  IF LINECOUNT=1 THEN CLS: DIVIDER=3: PRINT TAB(25);"SEGMENT STARTS AT :
      "CUR.SEG$:ELSE 1620
1560  PRINT "offset";TAB(28)"hexadecimal values";TAB(69)"ASCII code";
1570  COLOR 0,7: PRINT "hex    ";
1580  FOR LOOP1=HEXHEADING TO HEXHEADING+15
1590    DIVIDER = DIVIDER+1: IF DIVIDER = 4 THEN PRINT CHR$(221);:DIVIDER=0
1600    PRINT MID$(HEXVAL$,LOOP1,1)+"  ";
1610  NEXT LOOP1:PRINT CHR$(221)+" "+MID$(HEXVAL$,HEXHEADING,16):COLOR 7,0
      :DIVIDER=3
1620 ADDR$=RIGHT$("0000"+HEX$(LOOP),4)
1630 PRINT USING ADDR.FMT$;ADDR$;
1640 FOR LOOP2 = LOOP TO LOOP+15
1650    BYTECONTENT$=RIGHT$("00"+HEX$(PEEK(LOOP2)),2)
1660    DIVIDER=DIVIDER+1:IF DIVIDER=4 THEN PRINT CHR$(221);:DIVIDER=0
1670    PRINT USING BYTE.FMT$;BYTECONTENT$;
1680 NEXT LOOP2
1690 PRINT CHR$(221)+" ";
1700 FOR LOOP3=LOOP TO LOOP+15
1710    CHAR$=CHR$(PEEK(LOOP3)): IF CHAR$=>" " THEN PRINT CHAR$; ELSE PRINT "."
        ;
1720 NEXT LOOP3
1730 PRINT
1740 LINECOUNT=LINECOUNT+1: IF LINECOUNT<17 THEN 1810
1750             PRINT
1760 COLOR 0,7: PRINT " < SPACE-BAR > to continue ---------------------- < M >
     to return to menu ";: COLOR 7,0
1770 DEF SEG = 0: POKE 1047, PEEK(1047) OR 64
1780 RESP$=INPUT$(1)
1790   IF RESP$="M" THEN BEEP: GOTO 1020
1800   IF RESP$<>" " THEN BEEP: GOTO 1770: ELSE LINECOUNT=1
1810 NEXT LOOP
1820 GOTO 1020
1830 END
```

Listing 1. MEMPEEK.BAS program.

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*CP/M is a Digital Research TM. A 56K CP/M system is required.

Circle 284 on Reader Service card.

By Frank J. Derfler, Jr.

Smart Modems Challenge Hayes

US Robotics, Bizcomp Enter the Fray

Each of the modem makers is working hard to get a share of the data communications market. This month we will examine two new modems—the Bizcomp 1012 Intelligent Modem and the US Robotics Auto Dial 212A—that are challenging the lead of Hayes Microcomputer Products in the smart modem industry.

We will also look at BRS After Dark, a newly marketed public information utility that is setting out to provide different services for microcomputer users.

Modems: Smart, Intelligent, and Bright

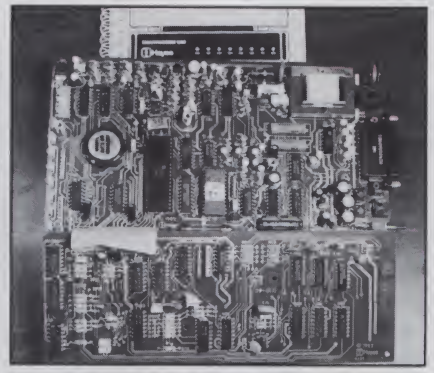
Before we look at some of the new players on the field, we need to understand the game.

A modem (as you should know if you are a regular reader of this column) is a device that converts the low-level direct current electrical signals from the serial port of your computer into signals that can be transmitted over telephone lines.

A modem allows you to connect your computer to the phone lines so you can communicate. The communication may be with a friend down the street, an electronic bulletin board across town or with an information utility across the nation, but you need a modem to get your signals into and out of the telephone network.

Until about two years ago, the most common modems used rubber cups to hold the telephone handset over a small speaker and microphone. This acoustic modem beeped tones into the telephone and sent direct current voltages to the computer. Several companies, notably D.C. Hayes and Potomac Micro-Magic, introduced printed circuit cards that are installed in the bus structure of a microcomputer and connected electrically to the telephone line.

Modems that make an electrical connection to the phone line are called direct-connect modems. Modems that plug into the computer data bus (without going through a serial port) are called integrated or bus-decoding modems.



The Hayes Stack Smartmodem 1200 uses two printed circuit boards that are mounted in a belly-to-belly configuration. The Hayes Smartmodem has become a leading product in the industry. The Smartmodem 1200 uses the Bell 212A signaling scheme to provide 1200-or 300-baud communications.

Direct-connection modems have become popular because they eliminate potential sources of local noise and can allow higher speed operation. Bus-decoding modems had great popularity initially, but they have lost ground to standalone modems containing microprocessor controls.

These smart or intelligent devices can be used with any computer or "dumb" terminal and with a variety of software. Integrated modems require specific software and can only be used with one machine. An exception to this is a line of integrated modems being developed for the IBM PC and PC clones. We will be covering these in coming months, but most of the IBM PC integrated modems arriving for review can use existing communications software.

Dennis Hayes and his crew (now renamed Hayes Microcomputer Products) introduced a "smart modem" at the National Computer Conference in Chicago in 1981. This device is called "smart" because it has an on-board microprocessor and because of the programming needed to allow it to perform relatively complex functions in response to simple commands from a terminal or microcomputer.

These commands are issued by typing alphanumeric characters from the keyboard and sending them out the data line. The Hayes Smartmodem can respond to 16 commands. The modem is alerted that a command will follow by typing the letters AT (from attention). The functions the modem will perform include autodialing a telephone number, automatically answering a ringing telephone line and sending status messages (for example, Connect, No Carrier and Ring) to the computer.

The smart or intelligent modem concept has become popular because it unloads some functions from the computer or terminal and makes the job of writing good communications software easier. Bizcomp and US Robotics have both recently released modems designed to challenge the Hayes Smartmodem 1200. These modems provide 1200-baud communications using the Bell 212 signaling scheme. They can operate as fully capable two-way communications devices at either 300 or 1200 baud.

Since the Hayes Smartmodem is certainly the largest-selling device, we will compare and contrast these new devices against the Hayes and against each other.

US Robotics Auto Dial 212A

The US Robotics Auto Dial 212A uses the same basic command set as the Hayes Smartmodem 1200. It transmits identical responses and reports, and has nearly the same front panel display. Nine light-emitting diodes give a constant picture of the status of operation.

The Auto Dial 212A is not, however, a direct copy of the Hayes. The electrical circuitry is quite different and the US

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Robotics device does the same job with a smaller parts count. In fact, the difference in layout and parts count is quite large.

The Hayes device consists of two boards, stacked belly-to-belly and connected by a 20-conductor cable. I counted more than 25 separate integrated circuit devices on the Hayes boards. The single US Robotics board runs with 13 integrated circuits. According to a spokesman from US Robotics, the company's device uses specially designed integrated circuits made for them by Intel.

A low parts count is not always a positive factor in electronic equipment; it could simply be associated with lower capabilities. But a low parts count can mean lower manufacturing cost, perhaps less power drain and heat and probably greater reliability.

The folks at US Robotics have provided a slightly different physical environment from the Hayes modem. The boxes are about the same size, but the power switch on the US Robotics device is on the front panel instead of being in the rear.

Additionally, the switch that sets certain operational characteristics is available through the back of the cabinet instead of being totally contained inside the cabinet. A ninth LED on the front panel indicates when the internal test mode is in use.

The US Robotics device includes an analog-loopback test capability that allows you to run a check on your communications software, the connecting cable and certain critical parts of the modem. They have provided two modular telephone jacks connected in parallel so that a telephone may be plugged into the modem and used in the normal manner.

A separate Y connector is not needed to use both the modem and phone from the same wall jack. The prototype modem I tested did not contain a speaker to provide audible monitoring of the telephone line, but I was assured that production units would have this feature.

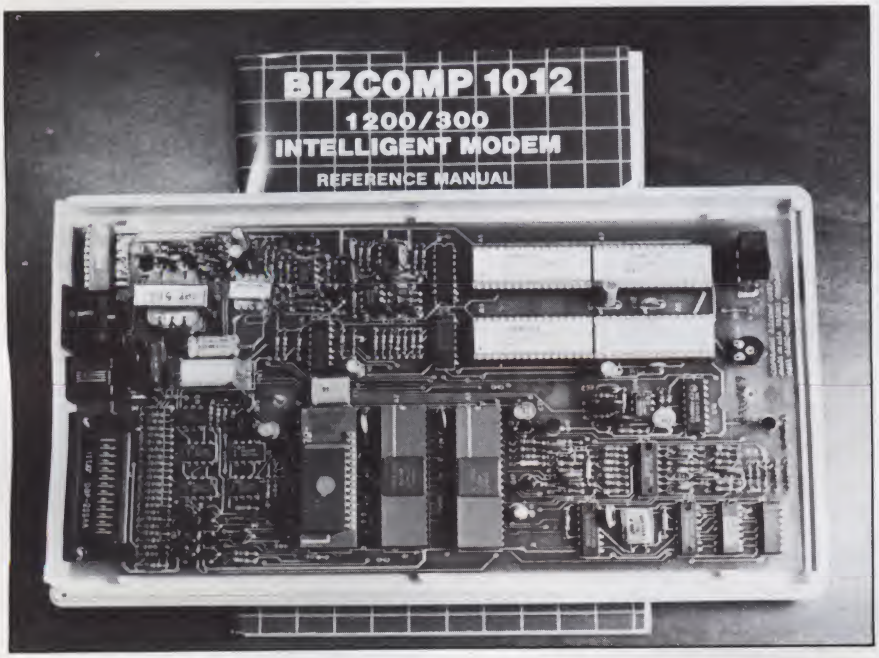
I used the US Robotics prototype for several weeks and was satisfied with its performance. Various comparisons between the Auto Dial 212A and other 212A modems on the bench did not bring out any operational differences as far as sensitivity or immunity to garble. I can't comment on the quality control or reliability of the production units, but I do know that, at a suggested list price of $599, US Robotics has a significant price advantage over the Hayes Smartmodem 1200 while providing essentially the same features.

You can contact US Robotics at 1035 West Lake Street, Chicago, IL 60607, or phone 312-733-0497 for more information.

Bizcomp Intelligent Modem

There are always people who have a little different and (hopefully) a little better idea of how a thing should be done. The people working at Bizcomp have decided that their modem should be called "intelligent" instead of smart and that it should use a different set of instructions from those used by Hayes.

However, the concept of the Bizcomp 1012 Intelligent Modem is exactly the same as that of the Smartmodem. Commands are sent to the modem over the normal data line and executed by an onboard processor with its own operating program. Results and status reports are returned to the computer by the device. The Bizcomp does, however, offer a different set of features.



The Bizcomp 1012 Intelligent Modem uses a different command set from the Hayes and US Robotics devices. It has the same basic functions, but it includes extensive self- and remote-test capabilities. It has only one status lamp and no monitor speaker.

Physically, the Bizcomp is about the same size as the Hayes and US Robotics devices. They all are designed to fit comfortably under a standard desk telephone.

The Bizcomp has only one indicator light in the front, but it's designed for several different uses. The Bizcomp's power switch is also in the front. There is only one telephone jack, but all of the function-setting switches are available through the rear panel. There is never any need to open a Bizcomp modem (indeed, I had a hard time figuring out how to do it). The single board in the Bizcomp has a low-chip population and it is not crowded.

The Bizcomp uses high-quality components and the layout and board design are efficient and conservative. The plastic cabinet of the Bizcomp really does not do justice to the quality of the components inside.

Operationally, the Bizcomp 1012 has several features the Hayes does not. First, Bizcomp supports four special self-test and remote test functions. The analog-loopback test is the same one described for the US Robotics device; it provides a good check of the local system.

The analog loopback self-test runs an error check internally within the modem and can isolate a problem within that device. Two kinds of digital loopback tests check the complete phone line connection as well as the modem at the other end. These sorts of tests are normally available in higher-priced modems used in large commercial installations.

The true value of having these functions available in the normal communications environment can be debated, but if you want them, the Bizcomp 1012 has them.

Another unique feature of Bizcomp is its ability to load and store a telephone number into the modem. This number will be automatically dialed when the "D" command is sent to the modem. It will be held in storage as long as the modem has power.

The Bizcomp 1012 is equipped with a busy-tone detector. This prevents it from trying to establish contact through a busy signal. This kind of capability is needed because the Bizcomp does not have a monitor speaker. The device operates silently and you have to interpret the flashing of the one light if you want to understand what is happening.

The unique command structure of the Bizcomp 1012 means that it is not compatible with many of the special features of some popular communications software. The automatic dialing features of Crosstalk, Ascom, PC-Talk and many other packages use the Hayes command

codes. The Bizcomp can be used with these packages, but all commands and numbers will have to be entered from the keyboard rather than by means of the automatic features of the software.

The Bizcomp 1012 has a list price of $895 and offers an alternative to the user who wants many self-test and line-test features in a modem under microprocessor control. It is well-designed and well-built, but the absence of operational feedback in the form of multiple flashing lights and audible monitoring and its unique command codes may limit its appeal to some users.

For more information, contact Bizcomp, 532 Weddell Drive, Sunnyvale, CA 94086, or call 408-745-1616.

BRS After Dark

If you are interested in data communications, I am sure you have seen the full-page ads in *Microcomputing* for BRS After Dark. Like CompuServe, this service is another attempt by a major information utility to get some income from its extensive investment in hardware and software during periods when it is not busy with commercial customers.

The BRS Search Service is a bibliographic database that has been aimed at professional researchers. It is well-known to librarians and commercial research firms. It provides users with descriptive references to published articles and other sources.

The service contains over 65 databases covering subject areas as diverse as articles in major newspapers and abstracts from scientific journals. All of these databases may not be available on the After Dark service, but in-depth coverage is provided in the fields of biology, chemistry, education, health care and research, social sciences, energy, the environment and rehabilitation of the handicapped.

BRS After Dark adds to the service some features that are normally provided to professional researchers. A multilevel menu lists the databases and provides added prompts for new users. This eliminates the need for specialized knowledge and makes the search of a database a quick and pleasant process.

The databases vary in the amount of information they provide about each referenced article or source. The database listing that deals with patents on file has some extensive descriptions consisting of several hundred lines.

The database providing summaries of articles on business and finance includes descriptions of about ten to 13 lines each. The medical database has extensive resources, but the descriptions are short. The BRS system is practical for gathering information on what articles to find in specific books and magazine issues, how much work has been done on a particular topic and who has done the work.

I was interested to see that there are currently 125 patents on file in the field of robotics. Many have been granted to persons in Europe and Japan, but they mainly deal with methods of positioning and control. I used BRS to convince myself again that there still is room in this area for a lot of growth.

BRS After Dark has a one-time subscription fee of $50. The service is available from 6 p.m. until midnight local time and the basic charge is $6 per hour.

Certain BRS database services do incur an extra cost, but you are warned before you enter them. The Management Contents database, for instance, costs a total of $13 per hour to use. The highest BRS After Dark rate is $14 per hour.

It is significant to note that these rates do not change if you use 1200-baud service. As far as I know, this is the first commonly available information utility not to include an extra charge for 1200-baud service. As a point of fact, there are people in the industry who claim that no utility really needs to charge a premium for 1200-baud service. The host computers actually operate more efficiently when they are not delayed waiting for data to come in and go out.

It does not necessarily follow that, with faster service, users will spend less time on the utility. They may well use the same amount of time and visit more databases.

Taking Advantage

The BRS After Dark pricing scheme is a good way to build users and to take advantage of the new lower-priced 1200-baud modems now entering the market. I wish the other utilities would see the advantage of lowering the rates for 1200-baud service.

A subscription to BRS After Dark would be a great gift for a person in a technical field, a college student, lawyer or health professional. The service provides a tremendous source of references and information and in many ways is the equivalent of having the services of a large university library. The service is available through the Uninet and Telenet communications carriers. That means that it can be used without long-distance call charges in the 400 or 500 largest cities in the United States.

According to Kathy Anderson, a spokesperson for BRS After Dark, the service intends to have electronic mail services available by the time this article is published. They also intend to provide other services, such as newsletters for health and engineering professionals and a technical software exchange.

Clearly, BRS After Dark is aimed at more than entertainment. The management at BRS intends to have it become a true information service for persons in the general public with specific information needs.

You can contact BRS After Dark by writing BRS, 1200 Route 7, Latham, NY 12110. You can phone them at 518-783-1161.□

By Robert W. Baker

Precision's Success: Superscript

Multi-Featured Word Processor

Superscript

Superscript is a new word processor package being produced for all new Commodore systems (along with existing PET and CBM models). It also will be available for the Commodore-64 under the name of Easy Script. Created in England by Simon Tranmer, it's now being distributed in the United States by Precision Software Ltd.

When you start reading the manual, Superscript sounds much like Wordpro, but keep on reading, because there's much more to it.

Superscript allows 20,000 characters in memory with a 32K system. That's 250 lines of text on an 80-column machine, or 500 lines on a 40-column machine. Text widths can vary from screen size to 240 characters wide, with full window scrolling in all directions.

With Superscript, you can view the original source with the imbedded commands or the actual formatted output itself on the screen. You can load files created by other packages, including Wordcraft, Wordpro and Silicon Office, for merging, editing or printing. In fact, many Wordpro files can be printed with just a few minor changes.

Executing Edit Commands

Editing facilities include the ability to execute commands on a succession of linked documents. You can search and replace a piece of text in one document or in a string of documents. Powerful transfer and copy facilities allow moving *ranges of lines* that do not have to start on line boundaries (like in older Wordpro versions).

Superscript also provides the ability to erase an entire memory buffer or the remainder of a sentence or paragraph.

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There are horizontal and vertical tabs for positioning, and decimal tabs for automatic alignment of decimal numbers. The tab settings can even be saved in the file along with the text!

Normal word processing functions weren't forgotten in the making of Superscript. There are commands for centering, justification, headers, footers, auto page-numbering, margin controls, lines per page and line spacing. Special print controls also can be generated; you can easily control underlining, enhancement, bold print, superscripts, subscripts, ribbon color change and variable line and character print, as supported by your particular printer.

The most exciting feature of Superscript is the background printing mode. This allows the printing of a document previously formatted and saved on disk while you edit another document. The background printing can even be a single page at a time. Superscript will interrupt your editing and inform you of the break in the output. Continuous background printing completely frees the screen for other tasks with few limitations.

Using Superscript is just like using Wordpro. Text is entered the same way, with formatting commands imbedded within the text. However, commands do not have to be on separate lines in Superscript.

Certain commands can be intermixed within the text itself. The same familiar "tick" is used for signaling commands, created by using the RVS key followed by the slash key. If you've used Wordpro before, you'll find it easy to switch over to Superscript.

Filling An Extra Space

Superscript doesn't have several of the problems my old Wordpro 3 has. For example, in Wordpro 3 you have to be careful if, when deleting characters, you happen to delete an end-of-paragraph symbol; when that happens, the remaining text is not shifted backwards as expected and you wind up with an extra space somewhere in the text. Superscript handles this with no problems.

Another thing you have to be careful with in Wordpro 3 is hitting Return when you're inserting text in the middle of a document. In Wordpro 3, hitting Return will erase the remainder of the current line. In Superscript, hitting Return when you're in Insert mode inserts an end-of-paragraph symbol at that point in the line and moves the remainder of the line to the start of a new line. It's handy for splitting lines in a hurry.

Another feature in Superscript is its ability to pause during the printing of formatted output at the point in a document where you insert the proper command. You also can do a conditional page command to skip to a new page if a certain number of lines are not available.

Superscript has separate margin controls for headers and footers. You can switch between video and printer output during formatted output and you can load disk directories without losing your text. You can even specify a printer offset, which allows you to move each page to the right a specific number of characters when it is printed. Thus, you can easily center your printed output on various papers.

If you're into mailing lists, Superscript directly supports the reading and writing of standard sequential data files. These are normally used for filling variable blocks within a document.

There's no limit to the size of a data file other than disk capacities. The data files can even be created by other programs, such as a general ledger package or database manager. You don't have to play any kinds of games with the files or worry about file sizes like you did with older versions of Wordpro.

The documentation provided with Superscript is superb. It's about 100 pages in length and broken into three major sections. The first section is a four-part tutorial that walks the user through most of the major functions in a reasonable order of importance.

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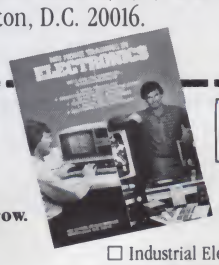

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The center section of the manual is a quick-reference guide that simply lists each command and function with a brief description. It's a great reference once you have some idea of what you're doing, and it's easy to find since it's printed on special blue paper. The manual's last section is a complete description of each command and function, in detail.

Disk Deficiency

The only things I didn't like about Superscript were related to the disk itself. The disk that Superscript comes on cannot be duplicated to a backup. The files can be copied to another disk but they will not run. Thus, you cannot make a backup copy of the master disk provided.

The program itself must be loaded from drive #0 since the program is segmented, and the first segment always tries to load additional segments from drive #0. The manual does not mention replacement policies for damaged disks, so check with your local dealer if this bothers you.

One other problem area: Superscript does not allow you to specify the device number of the disk you want to use. You always have to use the disk connected as device 8. For someone with two disks (like me) as devices 8 and 9, this is somewhat limiting. However, for the normal user this shouldn't present a problem.

I'm a longtime Wordpro user, and this is the first word processor I've seen that I like more. The idea of being able to read my existing Wordpro files plus those produced by several other word processors is attractive. And I could gain a number of new features without having to learn another way of doing things.

For more information, you should be able to see any Commodore dealer, or you can write Precision Software Ltd., 256 Post Road East, Westport, CT 06880.

Precision Software is about to release Superspell, a powerful spelling checker with a dictionary of over 30,000 words. It'll provide a user with definable dictionary extension and will be able to verify a 20,000-character file in less than two minutes. Pricing on both packages was not mentioned but should be comparable to existing packages.

Goto/Gosub Cross-Reference

Here's a simple but useful utility program that's actually a spin-off from a program I wrote several years ago.

If you've been following this column for a while, you may remember a program in which I printed a list of variables found in a Basic program stored on disk. Later, someone added to the original program to make it a true cross-reference listing, showing the line numbers of every variable reference. Well, this new program complements that original program by providing additional information about your program structure.

Target Lines

This program provides a list of every goto and gosub target line in your program, along with a list of every line that calls each target line. By target line, I mean the line number that the goto or

```
310 - 340
330 - 360
340 - 370 380 440 500 560
390 - 350
400 - 400
410 - 430
440 - 410
500 - 470
510 - 460 480
540 - 450 510
570 - 310
640 - 620
670 - 680
690 - 660 670
720 - 690
740 - 580
760 - 300 310 320
770 - 330 370 380 400 430 750 760
800 - 280 300 770
830 - 580 600
```

Listing 1. Basic GOTO XREF program.

```
100 REM ------------------------------
110 REM
120 REM   BASIC PROGRAM GOTO XREF
130 REM
140 REM      BY ROBERT W. BAKER
150 REM
160 REM ------------------------------
170 REM
180 REM PRINT A CROSS REFERENCE OF
190 REM GOTO & GOSUB REFERENCES
200 REM
210 REM ------------------------------
220 :
230 PRINT"□"SPC(14)"■GOTO XREF■■"
240 INPUT"■■DRIVE #   0■■■■";DR$
250 INPUT"■■FILE NAME";FL$
260 DIM GT(500),LL$(500): GN=0
270 PRINT"□□SCANNING FILE.....■■"
280 OPEN 15,8,15: GOSUB 800
290 OPEN 5,8,5,DR$+":"+FL$+",P,R"
300 GOSUB 800: GOSUB 760
310 GOSUB 760: IF V+V1=0 THEN 570
320 GOSUB 760: LN=V1+(256*V): LN$=" "+MID$(STR$(LN),2)
330 GOSUB 770
340 IF V=0 THEN 310
350 IF V=137 OR V=141 OR V=167 THEN 390
360 IF V<>203 THEN 330
370 GOSUB 770: IF V<>32 THEN 340
380 GOSUB 770: IF V<>164 THEN 340
390 LT=-1
400 GOSUB 770: IF V=32 THEN 400
410 IF V<48 OR V>57 THEN 440
420 IF LT<0 THEN LT=0
430 LT=(10*LT)+VAL(C$): GOSUB 770: GOTO 410
440 IF LT<0 THEN 340
450 Z=GN: IF GN=0 THEN 540
460 FOR X=0 TO GN-1: IF INT(LT)<>GT(X) THEN 510
470 IF RIGHT$(LL$(X),LEN(LN$))=LN$ THEN 500
480 IF LEN(LL$(X))>246 THEN LT=LT+0.1: GOTO 510
490 LL$(X)=LL$(X)+LN$
500 X=GN: NEXT X: GOTO 340
510 IF LT>GT(X) THEN NEXT X: GOTO 540
520 Z=X: FOR Y=GN TO Z STEP -1
530 GT(Y+1)=GT(Y): LL$(Y+1)=LL$(Y): LL$(Y)="": NEXT Y
540 GT(Z)=INT(LT): LL$(Z)=LL$(Z)+LN$
550 IF LT=INT(LT) THEN PRINT LT,
560 GN=GN+1: GOTO 340
570 CLOSE 5: CLOSE 15: OPEN 4,4
580 GOSUB 830: IF GN=0 THEN 740
590 FOR X=0 TO GN-1
600 IF PG=56 THEN FOR Y=1 TO 10: PRINT#4: NEXT Y: GOSUB 830
610 S$=RIGHT$("     "+STR$(GT(X)),5)+" -"
620 IF S$<>L$ THEN L$=S$: GOTO 640
630 S$="      "
640 PRINT#4,S$;
650 B=0: FOR Y=0 TO INT(LEN(LL$(X))/65)
660 A=B+1: B=A+65: IF B>255 THEN 690
670 C$=MID$(LL$(X),B,1): IF C$="" THEN 690
680 C=ASC(C$): IF C>47 AND C<58 THEN B=B+1: GOTO 670
690 LN$=MID$(LL$(X),A,B-A): IF LN$="" THEN 720
700 IF Y>0 THEN PRINT#4,"       ";
710 PRINT#4,LN$: PG=PG+1
720 NEXT Y
730 NEXT X: PRINT#4
740 PRINT"□□DONE■■": CLOSE 4: END
750 S$=S$+C$: GOTO 770
760 GOSUB 770: V1=V
770 GET#5,C$: GOSUB 800
780 IF C$="" THEN V=0: RETURN
790 V=ASC(C$): RETURN
800 INPUT#15,EN,EM$,ET,ES: IF EN=0 THEN RETURN
810 PRINT"□□DISK ERROR": PRINT EN;EM$;ET;ES
820 CLOSE 5: CLOSE 15: END
830 PRINT#4,"LIST OF GOTO/GOSUB REFERENCES IN PROGRAM: ";CHR$(34);FL$;CHR$(34)
840 PRINT#4: PG=2: RETURN
```

Listing 2. Sample output from GOTO XREF program lists GOTO/GOSUB references.

GEMINI–
FOR PRINTER VALUE THAT'S OUT OF THIS WORLD

Over thirty years of down-to-earth experience as a precision parts manufacturer has enabled Star to produce the Gemini series of dot matrix printers—a stellar combination of printer quality, flexibility, and reliability. And for a list price of nearly 25% less than the best selling competitor.

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Gemini's flexibility is embodied in its diverse specialized printing capabilities such as super/sub script, underlining, back-spacing, double strike mode and emphasized print mode. Another extraordinary standard feature is a 2.3K buffer. An additional 4K is optional. That's twice the memory of leading, comparable printers. And Gemini is compatible with most software packages that support the leading printers.

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gosub instruction passes control to (the line number listed after the goto or gosub command).

By the way, the multiline ON . . . GOTO . . . and ON . . . GOSUB . . . forms are also included. This gives you a handy way of finding out such matters as what subroutines or program lines are not being used or what subroutines are being used the most or least. I've found it handy in streamlining program size and/or execution times, or just in housekeeping.

When you run the program, it first asks for the drive number and filename of the program stored on disk to be analyzed. The program cannot be modified to read program files from cassette tape since they cannot be read as data files. Program files can, however, be read from disk as data files just as they appear in memory.

After opening the disk file, the program first reads and discards the two-byte load address (line 300). The program is then scanned in search of goto and gosub tokens (lines 310–560). As each token is found, the following line number or numbers are read and saved in the GT matrix. The number of the current line is saved in the LL$ matrix to create the cross-reference listing for the corresponding target line. This program assumes that the file being read follows normal program syntax and doesn't contain any abnormal situations. In other words, the error-checking is not 100 percent foolproof!

During the scanning of the program file, the link address for each line is read in line 310 and checked for a zero value that would indicate the program's end. The current Basic line number is read in line 320 and converted to a decimal number in LN and a string in LN$. Program lines are scanned by lines 330–440 and found target lines are added to the table by lines 450–560. Note that new entries in the matrix are inserted in their proper position to always keep the entries in ascending numerical order.

Collecting References

The target references are collected in the LL$ matrix entries. The first part of every entry in this matrix is the corresponding target line number that entry refers to. Each reference line number is just added to the end of the string in each entry as it is found.

If too many references occur for any particular line number, another entry is added to the LL$ matrix with the same line number, plus 0.1 to allow more references to be added. Remember that any character string cannot exceed 255 characters in length within Basic. So, if the list of references gets too close to this limit, another entry must be created for the new references.

As the program executes, each newly found target line is displayed when it is found so you can see how the program is progressing. Once the data is collected, it is formatted and printed on the printer. The program could be modified to display the data on the screen if you don't have a printer, but it's much easier to use printed output.

The program is currently limited to handling up to 500 target lines as set by the dimensions of GT and LL$ in line 260. This seems to be a reasonable limit for a 32K system. You may, however, run out of memory if the program you're analyzing contains an abnormally high number of goto and/or gosub calls. By the way, I avoided using Basic 4.0 disk commands, so the program should work on almost any Commodore system with a disk and printer.

Sample outputs (Listings 1 and 2) are included so you can see what happens when the program analyzes itself.

The top of the output in Listing 2 indicates the filename of the program that was analyzed. The left column of numbers lists the actual target lines found in the program. These are the lines branched to via goto instructions or called by gosub instructions.

Each program line containing a goto or gosub to the listed target line is listed to the right of the separating dash after the corresponding line number. If enough reference lines were found to fill more than one line, the target line number will appear only on the first line printed.

Misc

The replacement ROM that I mentioned last month (it upgrades the VIC-1540 disk to be compatible with the VIC-1541) is Commodore part number 901229-03. This ROM should be available through any Commodore dealer that normally provides equipment service. Cost is still undetermined but I've heard several people have obtained it for $45 to $50.

This upgrade makes the VIC-1540 disk work with the Commodore-64 system without doing Pokes to clear the screen. It also brings the recording format closer to that found on the CBM-4040 disk drives.

Earlier VIC-1540 (and some VIC-1541) drives had some reliability problems when you attempted to transfer disk files between the VIC-1540 and the CBM-4040 drives. This could normally be avoided by first formatting the disk on the VIC-1540 drive before writing to it on a CBM-4040 disk. The new ROM cleans up this small problem altogether.

By the way, if you do have to use a VIC-1540 disk on a Commodore-64 system, you can do a few simple Pokes to make it work. The following Poke, used prior to any disk command, turns off the screen:

POKE 53265,PEEK(53265 AND 239)

Do the following Poke to restore the screen to normal operation:

POKE 53265,PEEK(53265 OR 16)

Many people have been using a Poke 53265,11 before and a Poke 53265,27 after disk commands, but the Pokes shown here are those recommended by Commodore. Using a Poke of the modified Peek value avoids changing control bits that might affect other functions within the system and cause unwanted side effects.

If you're trying to use a Commodore-64 on a late-model Zenith television set, you have a small problem. The television set has an internal jumper wire to select interlaced or noninterlaced-type broadcast

signals. The Commodore-64 actually produces the opposite type of signals that your local television station produces. The result is a distorted display when you're trying to use the Commodore-64 on this type of television.

Your local television repair service can reverse the jumper inside the TV so your Commodore-64 will work with it, but then you lose picture quality for normal reception. The only way you can have the best of both worlds is to install a switch to let you select the proper mode from outside the TV set.

This same problem existed for the VIC-20 but it's easily eliminated with one simple Poke. Unfortunately, it cannot be corrected with a Poke on the Commodore-64.

Watch for the VSP expansion for the Commodore-64. This is supposed to add additional keywords to standard Basic for graphics and sound. Just what it will do, what it will cost and when it will be available are still indefinite.

Bowl-bound Software

Briley Software (PO Box 2913, Livermore, CA 94550) has upgraded its League Bowl-24 package that I reviewed some time ago. Now called League Bowl-36, the software package for bowling league secretaries now supports Peterson points, matched point and a host of other scoring systems.

Drop Briley Software a note for more details and current pricing.

VIC-20 Supplier List

Colin F. Thompson (1307 Colorado Ave., Santa Monica, CA 90404) is compiling a list of VIC-20 product suppliers. Along with each entry is a key letter indicating whether the supplier is a retail dealer, a hardware manufacturer or a software writer, or if the supplier works with a periodical newsletter or mail-order house. The list is by no means complete, but the December 5 update I received contains more than 100 entries.

For anyone interested, Colin will supply his list for $1.

Commodore on Compuserve

I've been pretty active on the Commodore Network on Compuserve lately. If you have any comments or suggestions, you can leave a message via EMAIL or on the Commodore SIG Bulletin Board. My user ID is 74325,1377 and I try to get on at least once or twice a week. Our local input number is busy most of the time, so it can take me several days before I can get through and log on.

There seems to be a number of Commodore users on Compuserve so far, and many are already using Commodore-64 systems. The bulletin board is especially useful if you need help or suggestions on how to do something. It's also a great way to meet other Commodore owners with similar interests.□

LETTERS TO THE EDITOR

Not in it for the Money

Wayne, your slip is showing. Your readers are mostly consumers, not exploiters. I refer to your unfortunate aside in your November editorial ("Grab Your Share of Low-End Market," p. 6) in which you wax philosophical and reveal that "the comfort of money makes up for the pain of being rich."

In the classical Faustian contract the pain is expected to persist longer than money can help. Come on, Mr. Green, technical subjects are pursued for the love of learning, not the economic power of riches. Please leave the seamy glimpses into true capitalist motives to the really grubby types. We hobbyists are watching.

Thomas C. Missidine
Montevallo, AL

Reply:

Thomas, while I recognize that there are a few readers who prefer, for philosophical reasons, not to use the power of their knowledge of microcomputers to generate wealth and another, far larger group, who prefer to avoid wealth because it is just too much work, I do like to put in my promotions every now and then.

Several hundred computer hobbyists have taken advantage of their background to get into the business. Starting at home by mail order, they are now up in the million-dollar class. It's there for those who are willing to work for it and take the chance . . . those who do not equate being rich with being grubby and seamy. I may be maligning you, but are you a teacher? . . . ***Wayne.***

It's So Simple

Having just received the only copy of *Microcomputing* I have seen to date (September 1982), I wanted to convey my satisfaction with your publication.

Your remarks concerning the "Declared War on Software Theives" (p. 6) are interesting, but seemingly a problem so easily solved in this age of technology that I am at a loss to understand why it even exists.

The answer is clear, simple and easily implemented. This solution would protect not only the software producer, but also the equipment manufacturer and his customers.

"Quickly," you shout—"how is such a grand thing possible?" "Elementary, Dear Green," I reply. The manufacturer merely hard codes the serial number of his machine into his circuitry. The software designer then instructs his program to first match the serial number he has encoded into his software with the serial number of the computer to which he has licensed his software.

Embedded in the software will be a self-destruct code. No number match between software and serial number of the machine, and the computer performs a goto "destruct." This wipes the program from memory and formats the disk—problem solved for the software merchant.

"Mercy, how basic," you say softly and with admiration. "But," you add, "you have also promised that both manufacturer and purchaser are to be protected by this process."

"True," I reply, "it happens this way: J. Crook performs a midnight requisition on a computer. He wants to run 'XYZ' software, and knowing the serial number must match, orders the software from Fantastic Software Company. The company first checks the serial number of the host machine against a stolen list. If the machine is clean, the software is individualized to the serial number of the host computer. If not, the manufacturer is notified of the location of the stolen machine. (They would know the address of the thief in order to be able to ship the software, would they not?)"

"My, my," you say, "the simplicity of the plan is amazing."

"Yes," I answer. "There are only a few drawbacks. One, the software manufacturer must personalize each software set he markets. This, however, is inexpensive protection for his business.

"Another problem is customer inconvenience. There would be no 'off-the-shelf' purchase of software for other than the most basic and inexpensive programs. The customer would have to wait for the individualized disks. In the event of an honest mistake—a number mismatch—the customer would be additionally inconvenienced."

Bryan English
Bellevue, WA

Reply:

Bryan, giant intellects (such as yours) lumber in parallel paths. You will no doubt be delighted to know that others have discerned the clear and obvious truth of your ideas and have progressed accordingly to actually invent the needed hardware to accomplish the deed.

Alas, attempts to interest hardware manufacturers in the concept have so far fallen on totally deaf ears. There is a massive shrugging of shoulders, with mumbling about the problem being no skin off their . . . er . . . nose. They also have been understandably reluctant to increase the cost of their computers by adding such a hardware key. And one more thing, a great many of the hardware firms are busy trying to stay in business one more month, never mind next year.

I suspect that a scheme such as you outlined will come to pass. By permitting the embedding of the key number over the phone via an 800 number, software firms will be able to customize programs before the customer takes them from the dealer. I frankly don't see any other practical route at this time . . . ***Wayne.***

Ooops

In the January issue of *Microcomputing* you published a review of a product described as the Mosaic 16K/32K board (Hardware Reviews, p. 138). However, the board is marketed as The Mosaic Expander. Those readers who read the review and want the product will find it under that name. Also the instruction manual is for both the Atari 400 and 800 computers.

Mike Calder
Portland, OR

A Satisfied Customer

After reading the articles on the Kaypro II in the December *Microcomputing*, I had several questions. I decided to write to Carlene Char ("Kaypro II—The Perfect Traveling Companion," p. 66) and Bob Hickey ("Unlocking Kaypro's Secrets," p. 71).

I am happy to report that Ms. Char took the time and effort to respond with a three-page letter within a week. More importantly though, it was helpful, to the point and addressed every question I raised.

Mr. Hickey responded with a helpful, explicit two-page letter which was really a good deal more than I expected.

Ms. Char and Mr. Hickey are to be commended for their efforts. Using writers

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An excellent book for the beginner. Many short programs and learning exercises. All important features of the ATARI computers are described (screen drawings, special sounds, keys, paddles, joysticks, specialized screen routines, graphics, sound applications, peeks, pokes, and special stuff). Also suggestions are made that challenge you to change and write program routines.
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This book describes advanced programming techniques like player-missile-graphics and use of the hardware-registers. Contains many ready to run programs in BASIC and one called GUNFIGHT in machine language.
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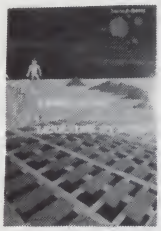

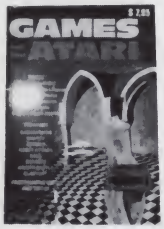

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Introduction to machine language for the BASIC programmer
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SOFTWARE IN BASIC FOR ATARI

Invoice Writing for Small Business
This program makes writing invoices easy. Store your products in DATA statements with order-number, description, and price. The program later retrives the description and price matching to the entered order-number. The shipping cost and the discount may be calculated automatically depending on the quantity ordered or entered manually. The description to the program tells you how to change the program and adapt it to your own needs. Comes with a couple of invoice forms to write your first invoices on to it.
Order #7201 **cassette version** **$29.95**
Order #7200 **disk version** **$39.95**

Mailing List
This menu driven program allows the small business man to keep track of vendors and customers. You can search for a name or address of a certain town or for an address with a certain note. 50 addresses are put into one file.
Order #7212 **cassette version** **$19.95**
Order #7213 **disk version** **$24.95**

Inventory Control
This program is menu driven. It gives you the following options: read/store data, define items, entry editing, inventory maintenance (incoming-outgoing), reports. The products are stored with inventory number, manufacturer, reorder level, present level, code number, description.
Order #7214 **cassette version** **$19.95**
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Programs from Book #164
The programs from book no. 164 on cassette. (Book included)
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Games on cassette. (Bomber, tennis, smart, cannon fodder, etc.)
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Microcomputer Hardware Handbook (845 pages)
Descriptions, pinouts and specifications of the most popular microprocessors and support chips.
A MUST for the hardware buff.
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$14.95

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Eight chapters exploring PET hardware. Includes repair and interfacing information. Programming tricks and schematics.
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SOFTWARE IN MACHINE LANGUAGE for ATARI

ATMONA-1
This is a machine language monitor that provides you with the most important commands for programming in machine-language. Disassemble, dump (hex and ASCII), change memory location, block transfer, fill memory block, save and load machine-language programs, start programs. Printer option via three different interfaces.
Order #7022 **cassette version** **$19.95**
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Order #7024 **cartridge version** **$59,00**

ATMONA-2
This is a tracer (debugger) that lets you explore the ATARI RAM/ROM area. You can stop at previously selected address, opcode, or operand. Also very valuable in understanding the microprocessor. At each stop, all registers of the CPU may be changed. Includes ATMONA-1.
Order #7049 **cassette version** **$49.95**
Order #7050 **disk version** **$54.00**

ATMAS
Macro-Assembler for ATARI-800/48k. One of the most powerful editor assemblers on the market. Versatile editor with scrolling. Up to 17k of source-Code. Very fast, translates 5k source-code in about 5 seconds. Source code can be saved on disk or cassette. (Includes ATMONA-1)
Order #7099 **disk version** **$89.00**
Order #7999 **cartridge version** **$129.00**

ATAS
Same as ATMAS but without macro-capability. Cassette-based.
Order #7098 **32k RAM** **$49.95**
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ATEXT-1
This wordprocessor is an excellent buy for your money. It features screen oriented editing, scrolling, string search (even nested), left and right margin justification. Over 30 commands. Text can be saved on disk or cassette.
Order #7210 **cassette version** **$29.95**
Order #7216 **disk version** **$34.95**
Order #7217 **cartridge version** **$69.00**

GUNFIGHT
This game (8k machine-language) needs two joysticks. Animation and sound. Two cowboys fight against each other. Comes on a bootable cassette.
Order #7207 **$19.95**

FORTH for the ATARI

FORTH from Elcomp Publishing, Inc. is an extended Fig-Forth-version, Editor and I/O package included. Utility package includes decompiler, sector copy, Hex-dump (ASCII), ATARI Filehandling, total graphic and sound, joystick program and player missile. Extremely powerfull
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Hardware – ADD–ONS for ATARI

PRINTER INTERFACE
This construction article comes with printed circuit board and software. You can use the EPSON printer without the ATARI printer interface. (Works with gameports 3 and 4).
Order #7211 **$19.95**

RS-232 Interface for your ATARI 400/800
Software with connector and construction article.
Order #7291 **$19.95**

EPROM BURNER for ATARI 400/800
Works with gameports. No additional power supply needed. Comes compl. assembled with software (2716, 2732, 2532).
Order #7042 **$179.00**

EPROM BURNER for ATARI 400/800 KIT
Printed circuit board incl. Software and extensive construction article.
Order #7292 **$49.00**

EPROM BOARD (CARTRIDGE)
Holds two 4k EPROMs (2532). EPROMs not included.
Order #7043 **$29.95**

EPROM BOARD KIT
Same as above but bare board only with description.
Order #7224 **$14.95**

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Astrology and Biorythm for ATARI (cass. or disk).
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Books + Software for VIC-20 (requires 3k RAM Exp.)
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#4883 Mailing List for VIC-20, 16k RAM $14.95
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like them reflects well on *Microcomputing* both in terms of general reputation and in sales. I will be far more inclined to purchase another issue or enter a subscription, as I now have reason to believe that my questions will be met with thoughtful responses. The December issue was the first I read. Now I may be hooked.

Jonathan Lobatto
New York, NY

A Correction

It was with great pleasure that I read Alfred Fant's article "Get Your Library in Order" (*Microcomputing*, December 1982, p. 48.). Since I have nearly 3000 books in my own library, I was eager to key in the program and get to work. I have, however, run into some problems. Line 320 reads:

320 ON CHOICE GOSUB 350, 510, 1760, 1970, 2190

I believe it should read:

320 ON CHOICE GOSUB 350, 510, 1760, 2030, 2190

This change starts menu 4 where I believe Mr. Fant intended it to start.

C.M. DeFrancisci
Olney, MD

The Disk Drive Dilemma

Your readers might be interested in an update to my article "Rx for Your Disk Drive Ills, " December 1982 issue (p. 40). In that article, I mentioned that my oldest drive, after I accidently crushed the head cable, refused to read or write. The cable repair done by Independent Peripheral Services (now of Central Point, OR) was quite satisfactory. Unfortunately, that same drive started acting up, again, last summer. But this time, the symptoms were completely different than those I had seen before.

Now the drive would not mount a disk under HDOS (Heath's Disk Operating System) and would give a "BDOS Err on C:" under CP/M. After checking around, I discovered that the drive motor speed was over two percent high and that the microswitch for track 00 wasn't functioning properly. The latter was obvious because, under HDOS, the drive would click while attempting to mount a disk. I could get the drive to mount manually by pressing the track 00 switch, but this didn't help under CP/M. I discovered that doing that is unsafe, because the cover to the H77 cabinet has to be removed.

Although I could have reset the excessive motor speed myself, I decided to send the drive to IPS a second time to adjust the position of the microswitch. I'm glad I did!

When the drive came back, it still wouldn't mount, so I returned it and, at IPS's suggestion, also mailed a pair of disks to help them position the switch.

When it returned the second time, the drive was as good as new. Once again, I am happy with IPS's work, but the replacement of the pressure pad raises an important question.

Quite a few hobbyists are using "flippy" disks with their one-sided drives. A "flippy," for those who aren't familiar with the term, is a disk which is flipped over like a phonograph record or cassette tape and used on the other side.

You can get them by either punching extra holes in a floppy disk's cardboard envelope or by installing a modification kit in your drive. Their one advantage is that your disk library costs are cut in half.

I experimented with them myself, but gave them up when I found out that the nap of the mat inside a floppy's envelope is oriented to clean off the disk surface only when it is rotating in the standard direction. When rotating the other way, the mat releases the dirt it's accumulated! My only disk crash occurred while using flippies.

The question which the worn pressure pad raises is—what happens when the pad wears so much that it starts gouging into the oxide layer? If you are using flippies, data on the side of the disk away from the head will be lost; in fact, you

could lose both sides if you access both during the same or adjacent sessions. You could lose valuable data while trying to cut costs! In my book, data integrity is more important than cost.

Kirk L. Thompson
Oxford, IA

Loop Unrolling's Not That Fast

Program optimization is often overlooked, so it was good to see an article encouraging such things. I do, however, want to point out an apparent error in Henry Seymour's article "Tune Up Your Basic Programs" (*Microcomputing* November 1982, p. 128). He introduces a technique called "loop unrolling" and gives an example of it.

The second version is said to be faster because the loop is only executed half as many times, but does twice the work. Unfortunately, the added statement (line 300) more than doubles the execution time for the loop.

In timing tests on my VIC-20, I find the improved version to be about five percent slower. I believe the other techniques presented in the article are valid methods for saving money and/or execution time.

Speaking of execution time, many people are comparing their systems using Mike Smith's shell sort (Letters to the Editor, *Microcomputing*, April 1982, p. 26). I typed the same routine into my VIC-20, using the Jiffy clock to measure execution time. For 500 random numbers, the average time was 343 seconds. That is 38 percent longer than COCO, 29 percent longer than IBM, but 23 percent less than the Apple and 37 percent less than Atari's ROM Basic.

When the program is modified as suggested by Craig Peterson (Letters to the Editor, *Microcomputing*, November 1982, p. 26), using as line 70 A(I)=I*((-1)AI), VIC took 317 seconds—only two seconds longer than the Apple, but 54 seconds faster than Atari.

Tom Pruett
Tegucigalpa, Honduras

Reply:

You're right Tom—loop unrolling is slower when using an interpreter. This is caused by the need to interpret the additional statements in the body of the loop. Some slight overhead is required to execute the L+1 subscript. Loop unrolling is therefore slower for an interpreter, but it is faster when using a compiler because of the absence of continued interpreting. The article was intended to be completely oriented toward the interpreter and the loop unrolling paragraph was inadvertently included. Thanks for catching my mistake.

Henry A. Seymour
New Orleans, LA

Delighted, but Appalled

I read the articles on the Kaypro II (December *Microcomputing*) and as a KayPro II owner, I am delighted by the publicity, but appalled at the errors.

The KayPro II has a good serial printer or modem interface that is easy to attach via CBIOS as the LST: device. The folks at Non-Linear Systems have even added a program (CONFIG.COM) that will do it for those without CP/M experience. Furthermore, you can reconfigure the baud rate from software. The parallel port is not the only printer port as Carlene Char has stated. This is easily found by a cursory reading of the owner's manual supplied with the machine.

The KayPro II is totally compatible with the Cromemco 5¼-inch single-sided/single-density (90K) format. This SS/SD format, long used by Cromemco, has been recently adopted by Xerox for their 820 computer. Cromemco has moved on to double-density and double-sided 5¼-inch disks, but all of their systems retain the capability of SS/SD formatting, reading and writing. The Cromemco or Xerox standard can be used by any

5¼-inch Cromemco drive. The Kaypro II is set up to write to SS/SD 5¼-inch disks in the B: drive with the Cromemco SS/SD format. These disks are also readable by anyone with a Xerox 820. Please note that this is the same approach that most manufacturers took with the eight-inch double-density formats.

I don't know what employee at Non-Linear Systems answered Bob Hickey's question, but both Mr. Hickey and that source were dead wrong. I, too, checked with the company and, fortunately, received the correct information. I was told that the format program that is supplied with the KayPro II is set up to write only in the double-density mode.

KayPro II double-density format is not compatible with the Cromemco double-density format. The solution to the problem is simply to format the single-density disk on the Cromemco's 5¼-inch drive with Cromemco's INIT.COM format program and specify SS/SD mode. It works, believe me.

As a Cromemco owner, I can attest that my SS/SD disks are compatible with the two systems.

I am in complete agreement with the authors about the documentation. The computer is well-designed and manufactured. However, the documentation is a sloppy set of photocopied manuals. The technical notes were inadequate to interface my Cromemco to my KayPro II. My manuals were also a set of "Dealer" manuals. I was impressed by the service from the company, however.

A phone call to my dealer was returned by the technical folks at Non-Linear Systems with complete information about the terminal attributes and the RS-232 interface characteristics of the machine. They offered to supply any further information that I might need and stated that a new manual and documentation were being prepared. After calls to a number of other manufacturers during my six years of microcomputer experience, I was delighted and impressed by this prompt and courteous treatment.

I am completely happy with my KayPro II computer. It has been a constant companion at work since the day that I purchased it. I highly recommend it to anyone with a need for a no-frills, portable, but complete, Z-80 computer.

Charles E. Stewart, M.D.
Beaver, PA

Reply:

Concerning the Cromemco question: The information was given to me when I called Non-Linear Systems shortly after I purchased my Kaypro II. I do not recall the name of the person giving me the information, but, to check it out, I again telephoned NLS.

I spoke with someone in the customer service department. I was first told that the Kaypro could not work with any other disk format. But, as I continued to question this, he added, "not to his knowledge." Then he asked me to hold a moment. When he came back on the line, he told me that any CP/M formatted disk would work on the Kaypro.

I protested, saying that I could not get my Superbrain CP/M disks to work in the Kaypro. Then I was transferred to the technical department. I was told that the Xerox 820 was the only additional disk format the Kaypro II could use. After pressing, I was told it wasn't confirmed, but Cromemco disks could be used.

I don't want to give the impression that one doesn't get the proper help from NLS in support of the Kaypro II. On other occasions, I have spoken with people at NLS and found them to be helpful and knowledgeable.

I thank Dr. Stewart for his information. The first time I called about compatible disk formats, I was seeking help in getting what programs I already had on my Superbrain over to the Kaypro II. I did not have access to either a Cromemco or a Xerox 820. Thus, I had no call to pursue what was a passing remark with respect to the Cromemco. I really had no reason to question a company spokesman's claim of an error in the advertising of Cromemco compatability.

Bob Hickey
Eagle River, AK

Reply:

At the time I wrote "Kaypro II—The Perfect Traveling Companion" (December Microcomputing, *p. 66), my computer dealer told me he was having trouble interfacing the Kaypro II with serial printers—despite the CONFIG.COM program and the owners manual. He contacted Non-Linear Systems and at the time my article was finished, the problem had not been solved.*

Yes, the RS-232 is there and a serial printer can be used with a Kaypro. However, I know of one case (and that's one too many) where the connection is not simply "plug-in and modify the baud rate."

I suspect a neophyte trying to interface a serial printer with a Kaypro will run into difficulty. So I stated, "Kaypro is only compatible with parallel printers." NLS did come out with a new, updated CP/M which I believe included a CONFIG.COM program that does work. So to be conservative this is how I should have stated it: "A serial printer may not work." However, for a beginner it's much easier to connect a parallel printer. Save the serial port for a modem.

Carlene Char
Honolulu, HI

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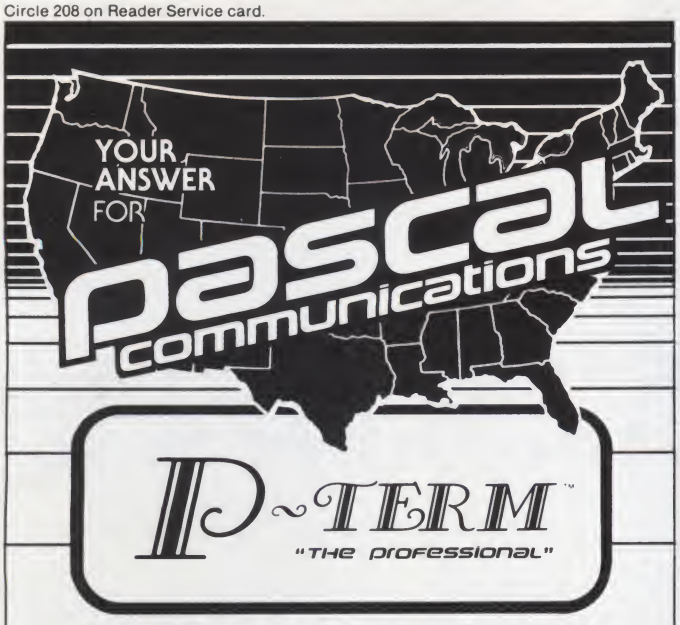

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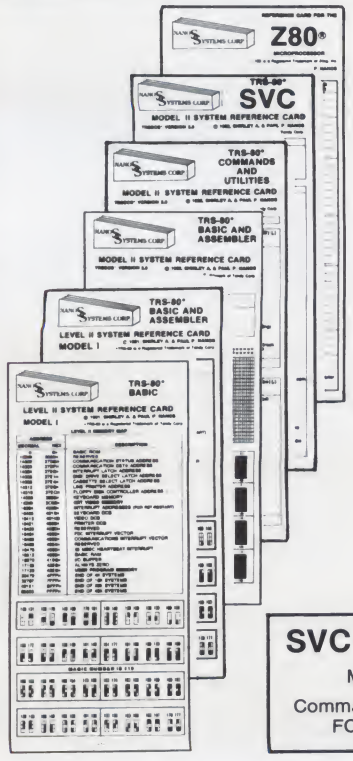

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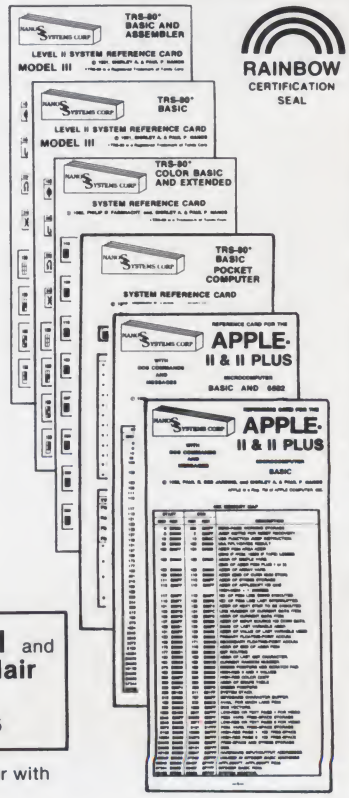

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Coasting and Cruising To Get to the Other Side

Pacific Coast Highway and Tumble Bugs

Two Atari Games with Familiar themes

If you're like me, you'll play a new game over and over again until you can't see straight anymore. Well, I received Pacific Coast Highway and Tumble Bugs on the same day, so I was forced to divide my attention. Not until the wee hours of the morning had I gotten my fill of these Atari 800 games.

Pacific Coast Highway

This game is easy to play, but difficult to master; it is an ingenious blend of concept (crossing a road while avoiding traffic) and stepwise increments of difficulty (faster traffic and a moving median strip). It is fun to play and appeals both to child and adult.

In Pacific Coast Highway, an intermittent series of vehicles flows left and right as on a multilane highway; you view the action as though you were on a traffic helicopter.

Your task is simple. With your joystick, you control your character, who can jump sideways as well as backward and forward. If you can thread your way through traffic and make it across, the game will continue. Otherwise, an ambulance will pick you up and you'll be declared dead on arrival. You get only three chances. In the one-player game you are a rabbit. In the two-player version a turtle opponent is added.

The highway is only half the fun. On the other side of the road is the ocean. Jumping from boat to boat, you must avoid the "drink" and attempt to reach the opposite shore.

What makes this second part so challenging is that, having psyched yourself up for the car-avoiding task, you must now aim for moving boats—quite a mental adjustment to make.

The game is timed, so every second spent thinking represents a lowered score. Once the Pacific has been crossed, you start back at the highway—a repetition that will last as long as you do.

Pacific Coast Highway has excellent graphics and sound effects. Only two features are questionable. First, the joysticks are a little slow, making it difficult to dodge traffic barreling down at 55 mph.

Second, both players are forced to restart a crossing when either one fails. The losing player forfeits a life, but that is little consolation to an opponent who is just about to make it all the way across. The game would have been better if it continued until both players bit the dust (or asphalt).

> Tumble Bugs is quite sophisticated, including good animation and a fast pace

Tumble Bugs

Tumble Bugs is another one of those all-too-common maze games. To its credit, however, it does display some features that make real mazes so interesting: dead ends, forked corridors and complexity. Don't be fooled; this is not a Pac-Man ripoff. It's an original and challenging game.

The labyrinth itself contains several times the number of passages of Pac-Man, while fitting on the same screen. Consequently, smaller graphics are involved.

To prevent eye-strain, Tumble Bug's designer supplies a magnifying glass: an enlarged rectangular portion of the screen showing your character with immediate surroundings.

The magnifier follows your every move through the maze. However, there is a drawback, and whether this feature is a help or a hindrance remains to be seen. By making the immediate area more visible, the edges or the magnifier obscure the area just beyond.

The object of the game is to eat up all the little dots in the randomly generated maze. Hampering your effort are eight little adversaries called "tumble bugs." Neither fast nor clever, these pursuers move relentlessly until, by chance, they stumble onto your trail. You see, as your character moves, a trail of red dots is left behind. As you play, you soon will realize how deadly this trail is, because a tumble bug will unerringly follow your "scent."

The only way to fool the critters is by making tracks down a branch corridor and then doubling back. If you're lucky, the bug will go the wrong way. Unfortunately, as the bug follows, it also erases your trail. The next bug will know that it is on a fresh trail. Only false-branching can keep the pursuers away.

Since the tumble bugs are slow, why can't you just outrun them? You can, for a while, but then you will discover that you have entered a dead end in the labyrinth, with the exit blocked by an approaching bug! It's all over, because you only get one chance.

Technically, Tumble Bugs is quite sophisticated, including good animation and a fast pace. New mazes are generated quickly. Joystick or keyboard control may be used. You have the ability to pause the game. This is helpful when the

phone rings or when you need a breather!

Topping all this off is a special feature. When you're caught by a tumble bug, an insect-like synthesized voice squeaks: "We gotcha!"—quite entertaining, and startling the first time.

(DataSoft Inc., 19519 Business Center Drive, Northridge, CA 91324. $29.95 each.)

Neal R. Enrick
Kent, OH

Protector II

Test your skill
And reflexes in
This rescue game

This mission of mercy begs for your skill and lightning-quick reflexes. You'll also need plenty of nerve to go against a mother ship, Xytonic Pulse-Trackers, Chompers, rocket-firing bases and vertical laser fields. Protector II is an altruist's nightmare.

Your Needlefighter must transport 18 people to the city of New Hope before a mother ship destroys them by dropping each person into a volcano. You must lug folks, one by one, over the Volcano of Death. (If it erupts, hot stuff gets ya!) After you return them to the village, the Verdann Fortress opens for the final rescue. The number of creatures saved and targets blown up by your laser-cannon fire determines your score. A fuel chart keeps track of your fissionable material.

Your Needlefighter travels and fires horizontally while you maneuver it up and down, and forward and backward, above grid-structured buildings, alien slopes and the Volcano of Death. You can blast on sight Xytonic Pulse-Trackers and other dancing shapes flurrying across the sky. You can briefly paralyze the mother ship with laser bursts, but you can't penetrate its antimatter shell. Laser fields are wire-thin red lines that shoot up like rods from the ground at varying intervals. You're awarded a bonus fighter every 10,000 points.

At higher levels, action is fast-paced, and the stuff that gets thrown at you resembles a hail storm (play is almost too fast; you can't catch a breath to think about a plan). As a novice at top-rung play, it was a battle just to stay alive. I couldn't save a single soul.

The high score lets you strive to break the record; it's a challenging goal. The sound effects grip you constantly—for example, your fiery jet-exhaust "gushes" nicely. The special graphics are a standout: tiny figures parachute from your Needlefighter whenever it explodes; the people atop buildings wave in life-like animation; during a blowup, your fighter fragments in a helter-skelter disarray; the Volcano of Death belches pulsatingly.

My only question after repeatedly playing this game is a nitpicking one. How is a Needlefighter able to pass through buildings without blowing up?

A fine feature before the start of the game allows you a glimpse of a full-scale mock-up of play. Before you get a chance to meddle with the controls, the action of the game materializes. It's like a peephole into the future.

The rescue motif conjures up visions of Cosmic Ark, while the horizontal fire and movement patterns recall several arcade and video systems, such as Defender and Cosmic Avenger.

This is a fantastic game for all ages. It requires an Atari 400/800.

(Synapse Software, 5327 Jacuzzi Street, Suite 1, Richmond, CA 94804. $34.95.)

John DiPrete
Cranston, RI

Easy-to-Use Software Premieres at Comdex

VisiON, 1-2-3 signal a trend in integrated software development.

By Frank J. Derfler, Jr.

In the September 1982 issue of *Microcomputing*, I reported on three industry trends I spotted at the National Computer Conference in Houston. Now, after returning from the Comdex Fall Computer Show in Las Vegas (Nov. 29–Dec. 2), I can report that the three original trends have been joined by a fourth powerful force.

The three trends I described in September included the move toward physically portable systems, the availability of high-density disk drives and the wide use of dual-processor microcomputers. At Comdex, it became apparent that the power of integrated software families will become another major motivating factor in the industry.

Also at Comdex, the trend toward portable systems became a flood.

The Compaq, Dot and Hyperion portables created quite a stir at the show (see photos). And the Otrona joined the Grid, Kaypro II and Osborne in the lineup of personal portables. You can now buy a portable microcomputer with a CRT and full-size keyboard in almost any price and power range.

Compatibility with the IBM PC was a hotly-debated issue at the show. The Compaq seemed to edge out the Hyperion for software compatibility and it was a clear winner in physical compatibility. You can take a specialized multifunction board like the Quadboard from Quadram and plug it directly into the expansion slots in the Compaq.

The move toward high-density disk drives also continues. As an example, Disctron, Inc., displayed a new half-height 5¼-inch Winchester hard disk drive with an unformatted capacity of 42.5 megabytes. That means you could put more than 80 megabytes of storage in the space occupied by one of the 5¼-inch drives in your Osborne or TRS-80 Model III (but you'd need an interface card).

This drive will sell in quantity to manufacturers for $1150.

In the floppy disk drive arena, Tandon announced a half-height 5¼-inch disk drive providing a megabyte of storage per drive. In the near future, you could be walking around with a Kaypro- or Osborne-sized system with 80 megabytes of hard disk and two megabytes of floppy disk. (Would you ever fill it up?)

The use of dual processors certainly seems to be accepted as the right way to make a transition from the eight-bit to the 16-bit world. Computers combining eight- and 16-bit CPUs can run both CP/M-80 and MS DOS software, so they can have the best of both worlds.

The new crop of dual-processor machines includes the Dot portable and the Fujitsu Micro 16. They joined the Zenith, North Star, Morrow and

The Fujitsu Micro 16 is a dual CPU machine that combines a Z-80 with an 8086. Fujitsu features the CP/M 86 operating system on this machine, but MS DOS is available. Except for the addition of the Z-80, the machine is an IBM PC work-alike. The standard machine comes with 128K of RAM, two disk drives, CP/M 86, spreadsheet and word processing software and an RGB color monitor for $3995. Fujitsu, Japan's largest computer maker, competes with IBM in mainframe computer systems.

Address correspondence to Frank J. Derfler, Jr., PO Box 691, Herndon, VA 22070.

The Seiko Series 8600 microcomputer system is an IBM PC "work-alike." It operates under MS DOS and can read PC disks. It uses unique packaged memory and expansion cards (like an Atari) and can be expanded into a multi-user, multitasking system. The release of this system at Comdex marked the first entry of Seiko, a Japanese manufacturer, into the personal computer business.

Quadram Corp., the Norcross, GA, manufacturer of the popular Quadboard multifunction card for the IBM PC, announced several new products at Comdex. Industrial users and people who want to see a full spreadsheet will be interested in this big screen monitor for the IBM PC; it's able to display up to 160 characters on each of 64 lines. The QuadScreen has a split-screen feature that allows authors and secretaries to display two pages of text on the screen at the same time. The $1950 QuadScreen package includes a monitor, software and controller board. Quadram also announced a QuadColor video card providing bit-mapped video of 600×400 elements and up to 16 colors at one time.

IBM PC/Baby Blue machines in this area. Digital Research Corp., the company that developed CP/M, announced the release of a Z-80 board for the IBM PC, so the people at Digital must see the trend continuing.

A slightly different approach was taken by Basis (pronounced bass-iss) Corp.; Basis provides a dual CPU machine with both CP/M-80 and Apple II compatibility. Its system fills a need for Apple users who want CP/M and a good keyboard (plus RGB color and many other goodies) at the same time. The Basis can take Apple II accessory cards, including the 16-bit 8086 expansion card, so it also can be an MS DOS machine.

1-2-3 and VisiON

While these trends continue to have a major impact on the industry, the real news at Comdex was the announcement of several new families of integrated software.

The Lotus Development Corp. has been building strong interest in its 1-2-3 software, which combines spreadsheet, graphing and database functions in one integrated package.

The development of 1-2-3 was previewed in *The Wall Street Journal* and other publications. Its capabilities as a spreadsheet are excellent and its capabilities as a graphics package and database are good but the real strength of the program comes in its integration. The 1-2-3 package moves smoothly between the functions with no need to return to the disk operating system or to call other programs or to change disks.

Experienced computer users know that 1-2-3 is doing a great deal of work and moving rapidly between modules, but the program is so friendly to the inexperienced user that its power becomes quickly accepted and the different functions become one.

1-2-3 is also fast. If you're used to the recalculation time needed for other spreadsheets, 1-2-3 will surprise you. The program does not seem to go to the disk for overlays, and it produces results quickly.

1-2-3 requires an IBM PC with a minimum of 128K of RAM to run. This package is one of the first to truly take advantage of the power of the 16-bit processor.

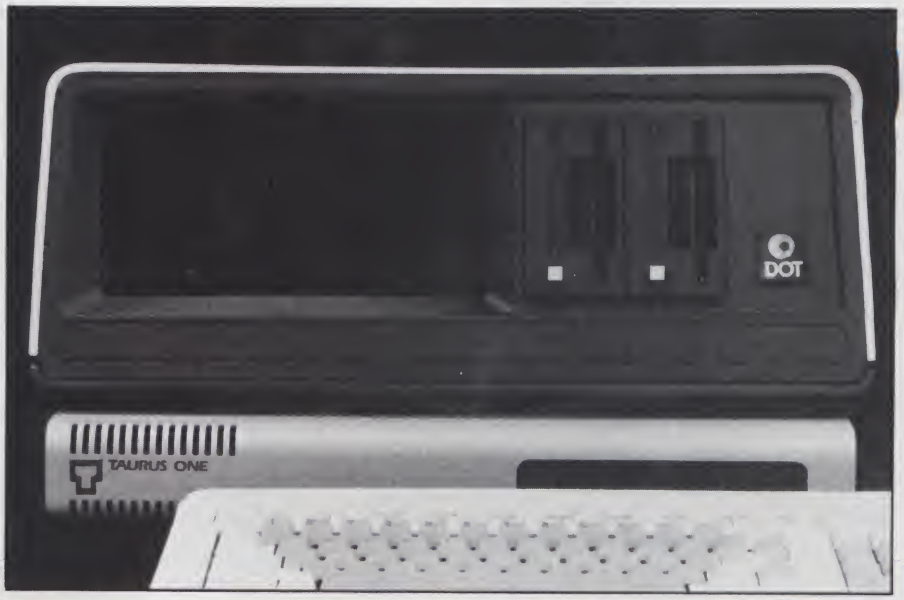
Lotus was not alone in introducing an integrated package at Comdex. If you read *The Wall Street Journal* on November 26, 1982, you saw a small announcement of a new product from VisiCorp called VisiON.

The announcement may have been small, but the response was great. Crowds jammed the VisiCorp booth to see demonstrations of this program integrating the capabilities of the "Visi family" of products.

Manfred Lettenmayer, president of Basis Corp., holds the heart of the Basis series of microcomputers. The Basis is unique because it combines the capabilities of the Apple II and standard CP/M machines. Note the six Apple II-compatible expansion slots on the Basis Board.

In fact, the announcement of VisiON (which won't be ready for release until summer) probably over-

The Basis 108 has both 6502 and Z-80 processors. Its other features include a full ASCII keyboard with a keypad and software programmable keys, 64K of RAM, 80-column or 40-column video and RGB- and composite-color video outputs. The German-made Basis 108 has a list price of $2795 with one disk drive.



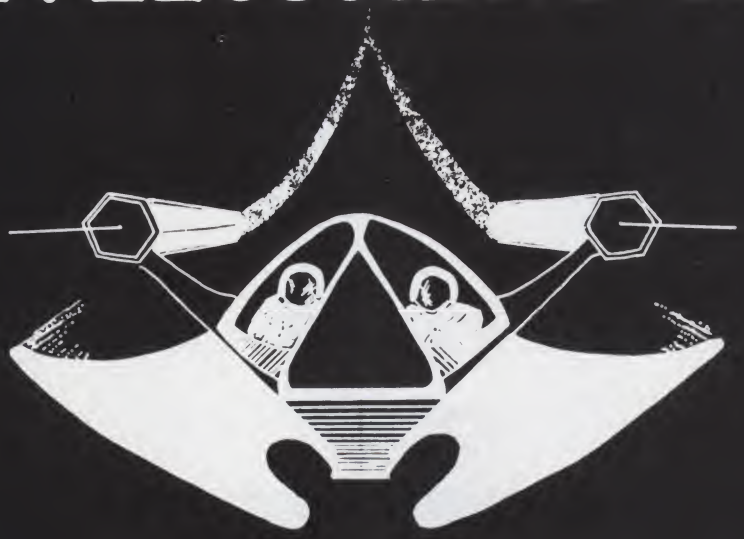
DOT (from Computer Devices, Inc.) and Taurus One (from Taurus Computer Products) offer a solution for a variety of data acquisition, process control and scientific laboratory applications. DOT features a 16-bit CPU with optional floating point, a 132-column high-resolution display with bit-map graphics, a built-in, high-speed, 80/132-column thermal printer, dual 3½-inch Sony disk drive and up to 704K of main memory. The Taurus One offers a 64K memory map, Z-80-based CPU with dual serial channels, clock, status display, vectored interrupts and expansion to 1024 analog and digital I/O points. The combined system costs less than $10,000.

shadowed the actual release of two new VisiCorp products, VisiWord and VisiCalc Advanced Version. These are nice products, but we've all seen spreadsheets and word processors. VisiON is different!

VisiON integrates the functions of VisiCalc, VisiPlot, VisiTrend and other Visi products so the user has to deal only with the computer through one standard set of commands.

VisiON's strongest feature is its screen display and ease of use. All of the VisiON commands are entered through a "mouse," a small device that is literally run over the desktop to position the cursor on the screen. A mouse operates much like a joystick, but it's more precise. It features several buttons that allow commands to be entered when the cursor is properly positioned.

GAME PROGRAM DEVELOPMENT KIT



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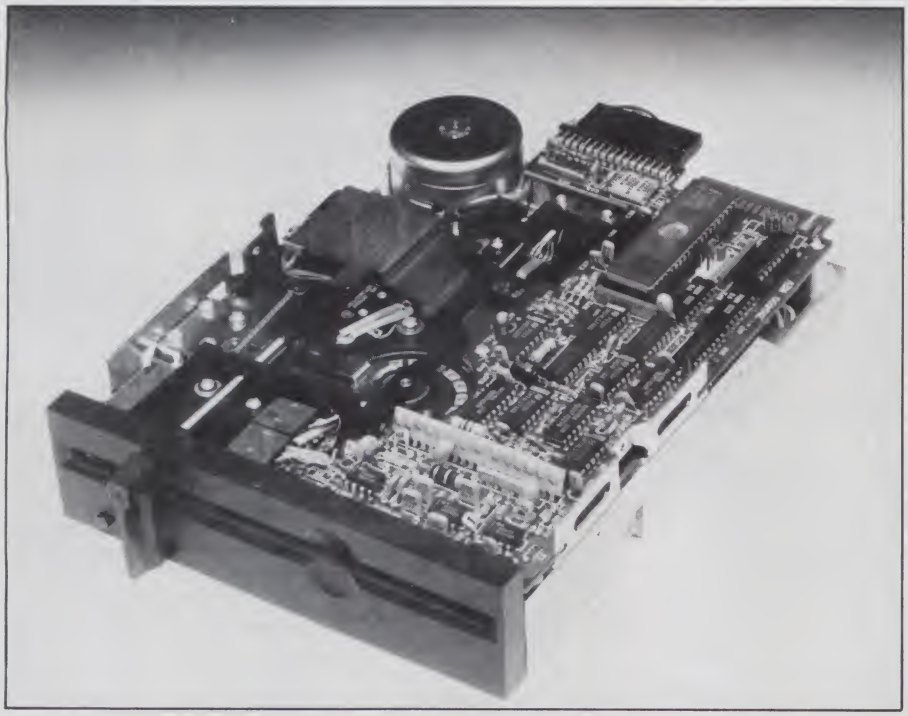
It wasn't all sunshine and computers at Comdex in Las Vegas. Unusual rain storms tested the roofs on buildings accustomed to gentle desert breezes. The Quadram booth had to be covered in plastic when a steady stream of water from the roof threatened to short-circuit the display.



Tandon Corp.'s Model TM55 Thinline 5¼-inch floppy disk drive features one-megabyte capacity in a half-height configuration.

The mouse used in VisiON connects to the RS-232-C port, so no special interior hardware is required.

The mouse and the menu display used in VisiON allow smooth entry of commands and fast definition of working areas.

The screen represents a desktop with different pieces of paper and functions on it. You can move quickly between the functions and the material you are working with. An excellent windowing capability allows you to focus the attention of the program on a particular area of your work for movement, filing, graphing or other functions.

VisiON was demonstrated on an IBM PC; VisiCorp representatives confirmed that the PC will be the first machine able to use this product. The PC had a hard disk and it is likely that large and fast disk storage will be needed to give VisiON the power to call the other VisiCorp software and integrate the functions of the various programs.

That's Bob Robertson, the president of Sorcim Corp., exchanging a few words with the Sorcim Super Robot. The Super Robot traveled around the convention floor inviting people to see the full line of integrated software products presented by Sorcim. Included was the SuperWriter word processing program released at Comdex.

It is impossible to do an in-depth contrast between VisiON and 1-2-3 at this point. 1-2-3 is ready for release at a price well below $500. VisiON is only in the demonstration phase and it will require the presence of much of the VisiCorp family of software, so the price will be substantial.

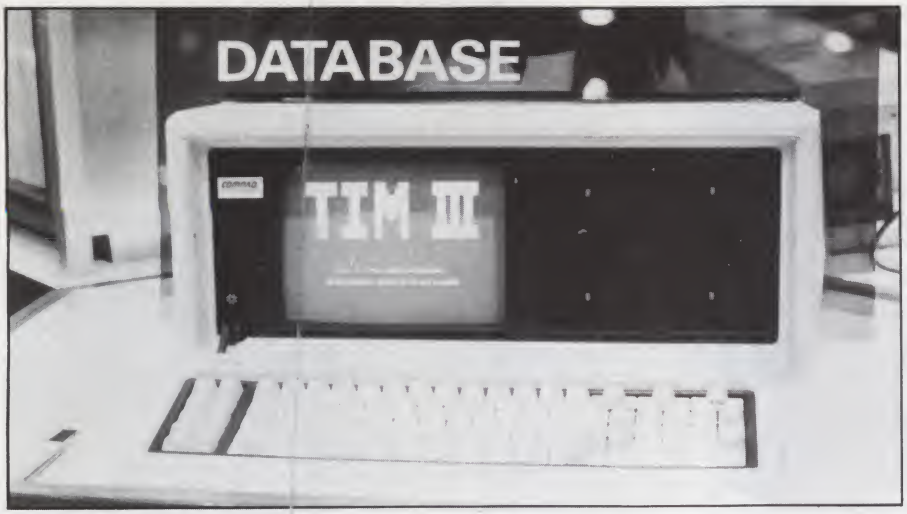
What we can comment on more specifically is the trend toward integration of software so that the individual functions become invisible to the user. With this software, the user doesn't need to know any programming language, or even a simplified command language, to use the full power of the computer. This is essentially "point and go" software. Computer novices can make productive use of the computer through this software within minutes.

Other Families

It was interesting to note that other companies announced the expansion of their software families at Comdex.

Sorcim released the SuperData office file manager, the SuperChart business graphics package and the SuperWriter text-processing system.

Sorcim also announced the Super Data Interchange software package, which provides the ability to exchange data between non-"Super" software and the Sorcim family. Sorcim had previously released an improved



The Compaq computer is a 16-bit portable system that is 100 percent compatible with the IBM PC. The system includes a nine-inch video display, an 8088 microprocessor, 128K bytes of RAM and one disk drive. The suggested retail price is $2995. The system includes ports for an optional RGB color monitor and a parallel printer. It can accept expansion cards designed for the IBM PC. The Compaq computer is manufactured in Houston, TX.

version of their SuperCalc spreadsheet program.

The people in the Sorcim booth at Comdex plainly understood that they needed something to compete with 1-2-3 and VisiON, but they were quick to point out that VisiCorp's VisiON would not be released until summer. Sorcim obviously will not be sitting on their hands until then.

The same attitude was evident in the discussions I had with people from Micropro. The folks who brought you WordStar and followed it with CalcStar, DataStar, SpellStar and other programs certainly will not miss out on the movement toward total integration.

This hard disk drive released by Disctron has the same depth and width as a 5¼-inch disk drive, but it is only half as high. This little device has an unformatted storage capacity of 42.5 megabytes.

The Yin and Yang Cycle

It's time for the software market to heat up again. In the late 1970s, we had hardware and very little software.

Then WordStar and VisiCalc (among others) came along to give us something to do with our equipment. The hardware cycle bloomed again with the introduction of the IBM PC and the large number of PC clones.

The fall Comdex has launched the industry on another software cycle that should last for many months. Now, what will hardware designers do to respond?■

Meet the Monthly Billing Deadline

It's easy, when two heavyweights—the IBM PC and WordStar—team up to simplify the billing process.

By Sam Davis

```
Billing Date? September 30, 1982
Filename? Billing.DMC
Month-Year? September 1982
Addressee? Mr. John Smith
Title? Vice President
Company? Company A
Street Address? 1000 Main St.
City, State-ZIP? Los Angeles, CA 9000
What Is CA Tax Rate? .065
Monthly Service Fee y/n? y
What Is Monthly Service Fee Amount? 1000
Any Balance From Last Month y/n? n
Is Above Info OK y/n? y
Any Press Releases y/n? y
Press Release Number? 022/82
DO NOT TYPE BEYOND THIS POINT-------------------------------------!
Number 1 Press Release Title Line 1? New Computer Products
Number 1 Press Release Title Line 2? Announced By Company A
Number 1 Press Release Title Line 3?
Date Release Mailed? 9/12/82
What Is Writing Cost? 250
What Is Non-Taxable Amount? 123.45
What is Taxable Amount? 45.67
Is Press Release Info OK y/n? y


Any Press Releases y/n? n
Any Miscellaneous Tasks y/n? y
DO NOT TYPE BEYOND THIS POINT-------------------------------------!
Miscellaneous Task # 1 Description Line 1? Write technical article
Miscellaneous Task # 1 Description Line 2? on use of word
Miscellaneous Task # 1 Description Line 3? processing for business
What Is Labor Amount? 500
What Is Non-Taxable Amount? 0
What is taxable amount? 0
Is Task Info OK y/n? y
Any Miscellaneous Tasks y/n? n
Is There A Clipping Service y/n? n
How Much Is Postage? 12.40
How Much Is Telephone? 34.56
What Is Telephone Billing Period?
From? 9/1/82
To? 9/30/82
Is Above Info OK y/n? y
Is Disk In Drive B y/n? y
WAIT--Insert Disk In Drive B And Continue
OKS
```

Example 1. Screen dump example of menu-driven billing program.

I initially bought the IBM PC to write articles and press releases for my public relations firm. Then, after gaining experience with the PC, I decided to look for a simple way to write programs that could be used for the business.

My first task was to develop an organized and efficient system to take care of monthly billing. The billing program had to allow data to be entered, processed and formatted. If a mistake was made entering nonnumerical information, the word processing system could be used to make corrections. I used Micro Pro's WordStar to review, edit and control printing of the programs I had written, thereby simplifying the programming task.

System Requirements

Organization of the billing program had to include three parts—data entry, data processing and data formatting. The data entry part required name, title, company and address of the client; California sales tax rate; monthly service fee charge; press release number, title and charges; miscellaneous task number, description and charges; and

Sam Davis is president of Davis Marketing Communications, 22543 Ventura Blvd., Woodland Hills, CA 91364.

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by George Young and Peter Stark

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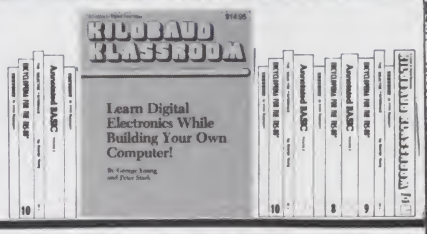
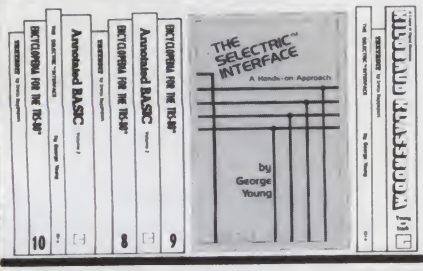
BK7386 (419 pages).....$14.95



THE SELECTRIC INTERFACE by George Young



You need the quality print that a daisy wheel printer provides but the thought of buying one makes your wallet wilt. The SELECTRIC™ INTERFACE, a step-by-step guide to interfacing an IBM Selectric I/O Writer to your microcomputer, will give you that quality at a fraction of the price. George Young, co-author of *Kilobaud Microcomputing* magazine's popular "Kilobaud Klassroom" series, offers a low-cost alternative to buying a daisy wheel printer. The SELECTRIC INTERFACE includes: step-by-step instructions, tips on purchasing a used Selectric, information on various Selectric models, including the 2740, 2980, and Dura 1041, driver software for Z80, 8080, and 6502 chips, tips on interfacing techniques. With The SELECTRIC INTERFACE and some background in electronics, you can have a high-quality, low-cost, letter-quality printer. Petals not included.

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by Irwin Rappaport

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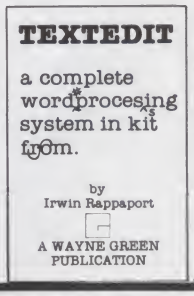
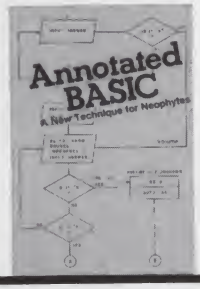


ANNOTATED BASIC

A New Technique for Neophytes



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postage, telephone and clipping service charges.

The data processing part required calculation of individual and total sales tax charges and calculation of overall total charges.

Data formatting included setting up a file to store the data on a disk, arrangement of the headings for each of the charges, setting up columns for totals and subtotals of all charges, eliminating appropriate items where there was no entry and a "Thank You" note and terms of payment.

One of the important aspects required of the billing program was a way to keep track of taxable charges and taxes collected, in response to quarterly California state tax statements. I had to include a listing of taxable charges and taxes collected in each monthly bill. Then, I could add individual monthly bills to get the quarterly figures. Without a billing program, calculation of taxable charges and taxes collected required a time-consuming look at all expenses.

The Billing Program

Although the program is specifically oriented toward public relations billing, you can apply the same fundamental approach to other service-oriented businesses, such as accounting, law, equipment repair, etc., simply by changing to the appropriate billing headings.

This program was written for my IBM Personal Computer system, which has 64K of RAM, two 5¼-inch disks with 160K each of storage capacity, an IBM display and an Anadex DP-9001 dot-matrix printer.

As designed, the billing program employs a question-and-answer method to obtain information. (See Example 1.)

To guide users, a dashed-line is displayed on the screen to indicate the space available for the titles of press releases and the description of miscellaneous tasks. You merely type in the information—line-by-line—making sure you don't go beyond the vertical broken line at the end of the dashed-line. Otherwise, you might overwrite numeric entries.

After data has been stored on a disk and played back through WordStar, you can make any necessary changes. Then give WordStar a Control-KD command to save the data on the disk in the modified form.

One advantage of using WordStar is that printing can be controlled either with the normal "P" print command or through the MailMerge option "M" command that allows printing of multiple copies with a single command. If you use the "P" command, only one copy at a time can be printed.

A further advantage of using WordStar is that it allows overprinting. You just insert a control-PB command at the beginning of the printout and everything is overprinted. This provides additional software control over printing, but it increases printing time.

I also used the word processor to design three forms used with the billing program. As shown in the form of Example 2, layout parallels the data requested in the billing program. Information is written on the forms during the course of the month, then when the billing is done at the end of the month the information is entered into the computer. A copying machine is used to make additional copies of the forms that were produced by the printer.

```
                                        FILENAME: INV_____________________
MONTH:_____________ YEAR:_____________

ADDRESSEE:_____________________________

TITLE:_________________________________

COMPANY:_______________________________

STREET ADDESS:_________________________

CITY,STATE ZIP:________________________

CA TX RATE:_____________      MONTHLY SERVICE FEE:____________________

Press Release

Number:_____________________________          Cost

Title:______________________________        Write:___________

____________________________________      Non-Taxable:___________

Mailed:_____________________________         Taxable:___________
-------------------------------------------------------------------------
Press Release

Number:_____________________________          Cost

Title:______________________________        Write:___________

____________________________________      Non-Taxable:___________

Mailed:_____________________________         Taxable:___________
-------------------------------------------------------------------------
Press Release

Number:_____________________________          Cost

Title:______________________________        Write:___________

____________________________________      Non-Taxable:___________

Mailed:_____________________________         Taxable:___________
-------------------------------------------------------------------------
Press Release

Number:_____________________________          Cost

Title:______________________________        Write:___________

____________________________________      Non-Taxable:___________

Mailed:_____________________________         Taxable:___________
```

Example 2. Form developed by word processor is used to gather information on billing expenses.

Printing Graphics

A sample of a typical bill is shown in Example 3. As you can see, the company logo is printed at the top of the bill. You can do this with an Anadex DP-9001 printer, which has a graphics mode that allows the printing of dots in a 75 × 72 (horizontal × vertical) matrix. (The DP-9001 also provides excellent quality print in the alphanumeric mode at 120 cps.)

Printing the logo with the Anadex printer involves a technique whereby up to six print needles may be activated at one time to produce graphics patterns. This allows any combination of up to 64 unique, vertical dot patterns, ranging from zero to six in a column. Using a Basic program, these unique dot patterns are controlled by the ASCII codes for the 64 nonnumeric

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Stock No. 83502 10 ea. of 68-82-100-120-150-180-220-270-330-390 OHM
Stock No. 82503 10 ea. of 470-560-680-820-1K-1.2K-1.5K-1.8K-2.2K-2.7 OHM
Stock No. 82504 10 ea. of 3.3K-3.9K-4.7K-5.6K-6.8K-8.2K-10K-12K-15K-18K OHM
Stock No. 82505 10 ea. of 22K-27K-33K-39K-47K-56K-68K-82K-100K-120K OHM
Stock No. 82506 10 ea. of 150K-180K-220K-270K-330K-390K-470K-560K-680K-820K-OHM
Stock No. 82507 10 ea. of 1M-1.2M-1.5M-1.8M-2.2M-2.7M-3.3M-3.9M-4.7M-5.6M-OHM

$3.95 each for any assortment

WILD ROVER

Touch switch capsule. Operating motion is .005" without the use of a levered arm. Extremely fast on and off with low noise. Normally open – rated 115 VAC, 1.6 amp-30 milliohm resistance – 615 radius by 160 thick.

Stock No.	1-9	10	25
12098	$ 1.28	$ 1.12	$ .95

60/40 ROSIN CORE SOLDER

Stock No.	Dia	Length (feet)	Weight (oz.)	Price
50075	062	9	1.5	$1.16
50076	062	25	4	2.39
50077	062	50	8	4.25
50078	032	33	1.5	1.31
50079	032	88.5	4	2.47
50080	032	175	8	4.57

TI WIRE WRAP SOCKETS

Tin plated phosphor bronze contact – 3 wrap

Stock No.	No Pins	1-24	25	100
11301	8	$ .45	$ .40	$ .36
11302	14	.66	.59	.54
11303	16	.72	.64	.58
11304	18	.82	.73	.66
11305	20	1.11	.99	.90
11306	22	1.26	1.12	1.02
11307	24	1.41	1.25	1.14
11308	28	1.71	1.52	1.38
11309	40	2.31	2.05	1.86

TI LOW PROFILE SOCKETS

Tin plated phosphor bronze com. ict pins with gas tight seal

Stock No.	No Pins	1-24	25	100
11201	8	$ .15	$ .13	$ .12
11202	14	.18	.15	.14
11203	16	.21	.18	.16
11204	18	.24	.21	.19
11205	20	.27	.24	.21
11206	22	.30	.26	.23
11207	24	.33	.30	.25
11208	28	.38	.34	.29
11209	40	.53	.45	.40

ELPAC POWER SUPPLIES – DC/DC CONVERTERS

Stock No. 13801- "Floppy Disc" Power Supply For Winchester Drives **$109.00**

13801-1 Data Sheet for 13801 $ .25

SINTEC Stock No 300 MW Type	ELPAC No	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (MA)	Dimensions (H×W×D) in Inches	Price
13825	CB3801	3.0-7.0	12±0.6	0-25	4⅛ x 5⅛ x 3.05	$ 7.95
13828	CB3811	3.0-7.0	12±0.6	0-25	4⅛ x 5⅛ x 3.05	7.95
13827	CB3802	3.0-7.0	15±0.7	0-20	4⅛ x 5⅛ x 3.05	7.95
13826	CB3812	3.0-7.0	15±0.7	0-20	4⅛ x 5⅛ x 3.05	7.95
13829	CB3804	3.0-7.0	28±0.7	0-10	4⅛ x 5⅛ x 3.05	7.95
13830	CB3814	3.0-7.0	28±0.7	0-10	4⅛ x 5⅛ x 3.05	7.95
1.5 W TYPE						
13831	CL3801	4.0-7.0	12±0.6	125	6⅝ x 1 x 2.77	$24.95
13832	CL3811	4.0-7.0	12±0.6	125	6⅝ x 1 x 2.77	24.95
13833	CL3802	4.0-7.0	15±0.7	100	6⅝ x 1 x 2.77	24.95
13834	CL3812	4.0-7.0	15±0.7	100	6⅝ x 1 x 2.77	24.95
13835	CL3804	4.0-7.0	28±1.4	50	6⅝ x 1 x 2.77	24.95
13836	CL3814	4.0-7.0	28±1.4	50	6⅝ x 1 x 2.77	24.95

13825-1 DATA SHEET FOR DC/DC CONVERTERS 25

Special of the Month!

IC-KOOLERS™ from UNITRACK® dissipate over 2 watts of heat from IC's, producing longer life and better performance. Just push IC-Kooler on – heat is collected from top and bottom of IC and dissipated. Won't shake loose!

Stock No.	No. Pins in IC	Price
22225	14	$.25
22226	16	.25
22227	18	.25
22228	20	.25

MODUTEC

SET of THREE $99.00

Miniclamp AC Volt-Ammeter allows singling one conductor out of many without disarrangement.

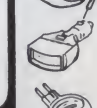
Stock No.	AC Amperes	Price
13730	0-25A	$39.50
13731	0-50A	39.50
13732	0-100A	39.50

ACCESSORY LINE SPLITTER allows fast readings of AC power consumption of plug in equipment without separation of leads.

Stock No. 13727 **$9.95**

POCKET SIZED BATTERY TESTER for all types of small batteries from 1.35v to 4.5v

Stock No. 13733 **$13.95**

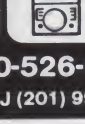


VOLT-I-CATOR automotive diagnostic meter plugs into lighter socket and indicates battery condition and charging rates.

Stock No. 13736 **$15.95**

AC VOLTAGE TESTER plugs into any 110v service receptable to check time voltage over 50-150 VAC

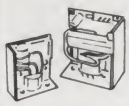
Stock No. 13735 **$14.95**



VOM-MULTITESTER versatile Volt-Ohm-Milliammeter in small package

Stock No. 13729 **$13.95**

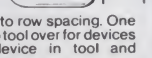
ELPAC POWER SUPPLIES – SOLV SERIES FULLY REGULATED



SINTEC Stock No	ELPAC Part No	Output Voltage	Output Current Rating	Dimensions (H×W×D) in Inches	OVP	Price
13802	SOLV15-5	5	3.0A	4-7/16 x 4 x 2	Fixed included	$39.95
13803	SOLV15-12	12	1.5A	4-7/16 x 4 x 2	Fixed included	39.95
13804	SOLV15-15	15	1.2A	4-7/16 x 4 x 2	Fixed included	39.95
13806	SOLV15-24	24	0.75A	4-7/16 x 4 x 2	Fixed included	39.95
13808	SOLV30-5	5	8.0A	5-5/8 x 4-7/8 x 3-3/18	OVP-4	59.95
13809	SOLV30-12	12	4.0A	5-5/8 x 4-7/8 x 3-3/18	OVP-4	59.95
13810	SOLV30-15	15	3.3A	5-5/8 x 4-7/8 x 3-3/18	OVP-4	59.95
13812	SOLV30-24	24	2.0A	5-5/8 x 4-7/8 x 3-3/18	OVP-4	59.95

13802-1 Data Sheet for SOLV Series 25

PIN FORMING TOOL



puts IC's on their true row to row spacing. One side is for .300 centers, Flip tool over for devices on .600 centers. Put device in tool and squeeze.

ONE TOOL DOES 8 Thru 40 PINS!

Stock No. 11059 **$12.95**

OK MACHINE AND TOOL

IC INSERTION/EXTRACTION KIT Includes DIP IC extractors and inserters to accommodate all ICs from 14 to 40 pins. Tools that engage conductive surfaces are CMOS safe and include grounding lugs. Stock No. 13309 **$37.74**

SOCKET WRAP ID DIP socket-sized plastic panels with numbered holes in pin locations. Slip onto socket before wire wrapping to identify pins. Also write on them for location, IC part number, function, etc. Simplifies initial wire wrapping, trouble shooting and repair.

13295 - 14 pin
13296 - 16 pin
13297 - 18 pin
13298 - 20 pin
13299 - 22 pin
13300 - 24 pin
13301 - 28 pin
13302 - 40 pin
13303 - 96 pin

$1.82 per pack

IC EXTRACTOR One-piece, spring steel construction. Will extract all LSI, MSI and SSL devices with 8 to 24 pins. Stock No. 13313 **$2.10**

SINTEC CO. Drawer Q Milford NJ 08848-9990

VISA MasterCard

TOLL 800-526-5960
FREE in NJ (201) 996-4093

Send for Free Catalog – over 1100 parts.

characters; that is, numeric codes are not used for graphics.

Decimal equivalents of the ASCII codes used for graphics range from 64 to 127. A sample of the dot combinations obtained from "@" to "0" is shown in Fig. 1. For example, if you want to produce the bottom four out of six vertical dots at one horizontal location, the code for "0" is used; "A" produces a single dot, "@" causes a blank space, etc. All you have to do is determine the required dot pattern for each horizontal position and then find the corresponding ASCII character.

For example, if you want to print the bottom four of the six possible vertical dots at one location, you use a BASIC LPRINT "0" statement. If you want five of these four-dot patterns in succession, use LPRINT "00000."

Since each horizontal pass of the

dmc

DAVIS MARKETING COMMUNICATIONS
22543 Ventura Blvd., Suite 222
Woodland Hills, CA 91364
(213) 716-7922

September 30, 1982

Invoice For September 1982

Mr. John Smith
Vice President
Company A
1000 Main St.
Los Angeles, CA 90000

I N V O I C E

		Subtotal	Total
MONTHLY SERVICE FEE:			1,000.00
PRESS RELEASE 022/82			
New Computer Products	Write:	250.00	
Announced By Company A	Non-Taxable:	123.45	
	Taxable:	45.67	
Mailed: 9/12/82	CA Tax:	2.97	$422.09
MISCELLANEOUS TASK # 1	Labor:	500.00	
Write technical article	Non-Taxable:	0.00	
on use of word	Taxable:	0.00	
processing for business	CA Tax:	0.00	$500.00
Postage:			$12.40
Telephone (from 9/1/82 to 9/30/82)			$34.56
Overall Total:			$1,969.05
	Total Taxable:	$45.67	
	Total CA Tax:	$2.97	

Terms:
Net 10 Days
Thank You
DAVIS MARKETING COMMUNICATIONS
Billing.DMC

Example 3. Typical bill produced by billing system.

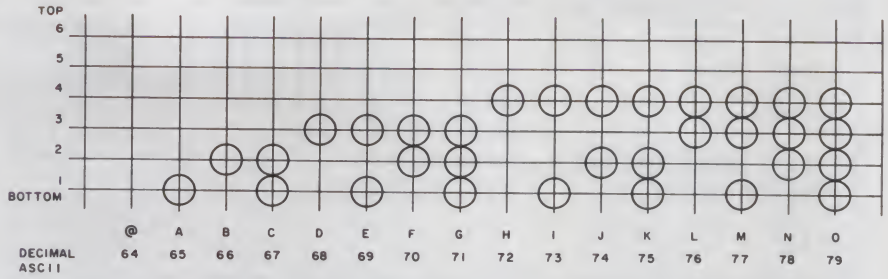


Fig. 1. Dot patterns for ASCII characters @ through 0 using the Anadex DP-9001 printer. The equivalent decimal number corresponding to the ASCII character is also shown.

printer can only generate a row of up to six vertical dots, you have to make enough passes to generate the desired graphics pattern. If a logo is 24 dots high, four passes must be made. The best way I found to work out details of the required pattern is to draw it on graph paper, break it up into groups of six vertical dots and then determine the appropriate ASCII characters. Details of the start of passes 6 and 7 of my business logo are illustrated in Fig. 2; included are the specific dot patterns and their corresponding ASCII codes.

The IBM Basic program listing for the logo is contained in Listing 1. It starts out with the three line feeds (LPRINT) and then "CHR$(28)," which puts the Anadex printer in the graphics mode. It takes nine passes (five seconds) to print the logo. Note

```
10  REM DMC logo      8-29-82
20  LPRINT:LPRINT:LPRINT     '**Three Line Feeds**
30  LPRINT CHR$(28);:GOSUB 380  '**Enter Graphics Mode**
40  REM ********PASS 1*********
50  FOR N=1 TO 24:LPRINT "@": NEXT N
60  LPRINT CHR$(127);CHR$(127);"ppppppp";CHR$(127);CHR$(127);"6"
70  REM ********PASS 2*********
80  GOSUB 380:FOR N=1 TO 24:LPRINT "@":NEXT N
90  LPRINT CHR$(127);CHR$(127);"@@@@@@@@";CHR$(127);CHR$(127);"6"
100 REM ********PASS 3*********
110 GOSUB 380:FOR N=1 TO 24:LPRINT "@":NEXT N
120 LPRINT CHR$(127);CHR$(127);"@@@@@@@@";CHR$(127);CHR$(127);"6"
130 REM ********PASS 4*********
140 GOSUB 380:LPRINT "@@@@@ACFFLLXXpppppp";CHR$(127);CHR$(127);"@@";CHR$(127);
    CHR$(127);"@@@@@@@@";CHR$(127);CHR$(127);
150 LPRINT "@@@@@ACFFLLXXpppppXXLLFFCCFFLLXXpppppppXXLLFFCA@@@@@";
160 LPRINT "@@@@@CCFFLLXXpppppppppp";CHR$(127);CHR$(127);"6"
170 REM ********PASS 5*********
180 GOSUB 380:LPRINT "@AG^xp@@@@@@@@AACCCC";CHR$(127);CHR$(127);"@@";
190 LPRINT CHR$(127);CHR$(127);"@@@@@@@@";CHR$(127);CHR$(127);
200 LPRINT "@AG^x``";"@@@@@@ACCCCCCA@@@@@@@@@@ACCCCCCA@@@@@@`x^GA@@"
210 LPRINT"AG^xp@@@@@@@@AACCCCCCCC";CHR$(127);CHR$(127);"6"
220 REM ********PASS 6*********
230 GOSUB 380:LPRINT "O";CHR$(127);"p@@@@@@@CO¦p``@@@@@@@@";
240 LPRINT CHR$(127);CHR$(127);"@@@@@@@@";CHR$(127);CHR$(127);"O";CHR$(127);
    "p@@@@@@@O";CHR$(127);"p`@@@@`p";CHR$(127);"O@@@@@@@@O";CHR$(127);"p`@@@@`p"
    ;CHR$(127);"O@@@@@@@";"p";CHR$(127);"OO";CHR$(127);"p@@@@@@@CO¦p``6"
250 REM ********PASS 7*********
260 GOSUB 380:LPRINT "¦";CHR$(127);"C@@@@@@@p¦OCAA@@@@AACO¦¦@@@@@@@C";CHR$(127);
    "¦";CHR$(127);CHR$(127);"@@@@@@@@";CHR$(127);CHR$(127);"@@@@@@@@";CHR$(127);
    CHR$(127);"@@@@@@@@";CHR$(127);CHR$(127);"@@@@@@@@";CHR$(127);CHR$(127);
270 LPRINT "@@@@@@@@";CHR$(127);CHR$(127);"¦";CHR$(127);"C@@@@@@@p¦OCAA6"
280 REM ********PASS 8*********
290 GOSUB 380:LPRINT "@`x^GCA@@@@@@@``pppp``@@@@@@@ACC^x`@";CHR$(127);CHR$(127);
    "@@@@@@@@";CHR$(127);CHR$(127);"@@@@@@@@";CHR$(127);CHR$(127)"@@@@@@@@";
    CHR$(127);CHR$(127);"@@@@@@@@";CHR$(127);CHR$(127);"@@@@@@@@";
300  LPRINT CHR$(127);CHR$(127);"@`x^GCA@@@@@@@`ppppppp";
     CHR$(127);CHR$(127);"6"
310 REM ********PASS 9*********
320 GOSUB 380:LPRINT "@@@@@`pxXLLFFFCCCCCCCCFFFLLXxp`@@@@@";CHR$(127);CHR$(127);
    "CCCCCCCC";CHR$(127);CHR$(127);"@@@@@@@@";CHR$(127);CHR$(127);"CCCCCCCC";
    CHR$(127);CHR$(127);"@@@@@@@@";CHR$(127);CHR$(127);"CCCCCCCC";
330 LPRINT CHR$(127);CHR$(127);"@@@@@`pxXLLFFFCCCCCCCC";CHR$(127);CHR$(127);"6"
340 LPRINT CHR$(29)          '**Enter Alphanumeric Mode**
350 LPRINT TAB(9)"DAVIS MARKETING COMMUNICATIONS"
360 LPRINT TAB(9)"22543 Ventura Blvd., Suite 222":LPRINT TAB(9)"Woodland Hills,
    CA 91364":LPRINT TAB(9)"(213) 716-7922"
370 END
380 FOR N=1 TO 57:LPRINT "@":NEXT N: RETURN
```

Listing 1. Basic program to produce "dmc" logo on Anadex DP-9001 printer.

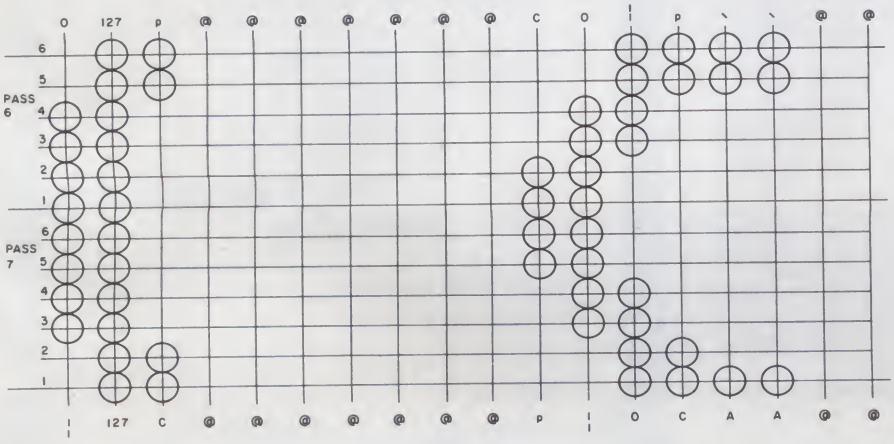


Fig. 2. Beginning of passes six and seven of the "dmc" logo. Line numbers indicate the six possible dot pattern lines of each horizontal pass. Characters shown above and below indicate the ASCII character for each position; "127" indicates the Basic statement for CHR$(127).

Listing 2. Billing program for the IBM microcomputer.

```
10  REM Davis Marketing Communications Monthly Billing;mobill.dmc 9-07-82
20  DIM N(20),K(50),NEMT$(100),TKL1$(50),TKL2$(50),TKL3$(50),LBMT(50),TM(50)
30  DIM NTMT(50),TXMT(50),MX(50),MTX(50),CTX(50):KEY OFF: CLS '**Clear Screen*
40  REM ******ENTER ADDRESSEE, COMPANY ADDRESS********
50  LINE INPUT "Billing Date? ";DT$
60  INPUT "Filename";FINAM$:INPUT "Month-Year";MOYEAR$:INPUT "Addressee";AD$
70  INPUT "Title";TI$:LINE INPUT "Company? ";CO$
80  INPUT "Street Address";ADDR$: LINE INPUT "City, State-ZIP? ";CSZ$
90  INPUT "What Is CA Tax Rate";CATXRT: INPUT "Monthly Service Fee y/n";MSF$
100 IF MSF$ = "n" GOTO 120
110 INPUT "What Is Monthly Service Fee Amount";SFAMT
120 INPUT "Any Balance From Last Month y/n";NEB$:IF NEB$="n" GOTO 140
130 INPUT "What Is Balance Forward";BAL
140 INPUT "Is Above Info Ok y/n";AOK$:IF AOK$ = "n" GOTO 50
150 REM *******ENTER PRESS RELEASE INFO*************
160 PRT = 0:PCT = 0:PTX = 0      '**PR Totals Initial Conditions**
170 FOR N = 1 TO 20: INPUT "Any Press Releases y/n";APR$(N)
180 IF APR$(N) = "n" GOTO 370:IF APR$(N) = "y" GOTO 190
190 INPUT "Press Release Number";PRN$(N)
200 PRINT "DO NOT TYPE BEYOND THIS POINT----------------------------------;"
210 PRINT "Number"; N "Press Release Title Line 1? ";
220 LINE INPUT PRT1$(N)
230 PRINT "Number"; N "Press Release Title Line 2? ";
240 LINE INPUT PRT2$(N)
250 PRINT "Number"; N "Press Release Title Line 3? ";
260 LINE INPUT PRT3$(N)
270 INPUT "Date Release Mailed";DRM$(N)
280 INPUT "What Is Writing Cost";PWRT(N)
290 INPUT "What Is Non-Taxable Amount";NTXMT(N)
300 INPUT "What is Taxable Amount";TAXMT(N)
310 INPUT "Is Press Release Info OK y/n";PROK$:IF PROK$ = "n" GOTO 190
320 CX(N) = TAXMT(N)*CATXRT*100: TX(N) = CINT(CX(N)) '**Roundoff Tax**
330 CATX(N) = TX(N)*.01
340 TOT(N) = CATX(N) + TAXMT(N) + NTXMT(N) +PWRT(N)
350 PRT=PRT+TOT(N):PCT=PCT+CATX(N):PTX=PTX+TAXMT(N):NEXT N '**PR Totals**
360 REM ********ENTER MISC. TASK INFO********
370 MT = 0:MCT = 0:MTX = 0      '**Misc. Task Totals Initial Conditions**
380 FOR K = 1 TO 50: INPUT "Any Miscellaneous Tasks y/n";NEMT$(K)
390 IF NEMT$(K) = "n" GOTO 560 :IF NEMT$(K) = "y" GOTO 400
400 PRINT "DO NOT TYPE BEYOND THIS POINT----------------------------------;"
410 PRINT "Miscellaneous Task #"; K "Description Line 1? ";
420 LINE INPUT TKL1$(K)
430 PRINT "Miscellaneous Task #"; K "Description Line 2? ";
440 LINE INPUT TKL2$(K)
450 PRINT "Miscellaneous Task #"; K "Description Line 3? ";
460 LINE INPUT TKL3$(K)
```

More

that a "6" is used at the end of each pass; it causes a carriage return.

Generation of each dot pattern requires either the corresponding ASCII character or its decimal equivalent with a CHR$ statement. CHR$(127) is the ASCII code for "DELETE" and it generates six vertical dots. When the graphics mode is completed, you get back into the alphanumeric mode by printing "CHR$(29)."

Note that each pass begins with GOSUB 380. This subroutine controls the space between the start of the logo and the left-hand edge of the paper. In Instruction 380, the margin is set to one inch by the number "57"; therefore, the margin can be changed by merely changing the "57" to another number.

Program Listing

The billing program (Listing 2) consists of a data entry mode followed by storage, processing and formatting. The program asks who the company contact is, his title, company name and address. After this series of questions, the user is asked if the information is OK. An "n" answer starts the series of questions over again from the

beginning. A "y" answer starts a series of questions regarding press releases.

Press release information consists of one line for the identifying number, three lines for the title and another for the date mailed. This information is entered in a loop whereby as long as you answer "y" to the question, "Any Press Releases?" you are asked for information about the next press release. When you enter answers to these questions, the CRT screen asks, "Is Press Release Info OK?" If the answer is "n," you go back to the beginning of the last press release and reenter data.

At the end of the press release loop, the question, "Any Press Releases?" reappears. If the answer is "n," you jump to the question, "Any Miscellaneous Tasks?" This causes a loop for miscellaneous tasks, which are described on three lines. After each miscellaneous task loop, the question "Is Task Info OK?" is asked. If the answer is "n," you go back to the beginning of the last-entered task; if the answer is "y," you go to the question, "Any More Miscellaneous Tasks?" If the answer to this is "y," you go back to

Listing 2 continued.

```
470 INPUT "What Is Labor Amount";LBMT(K)
480 INPUT "What Is Non-Taxable Amount";NTMT(K)
490 INPUT "What is taxable amount";TXMT(K)
500 INPUT "Is Task Info OK y/n";TKOK$: IF TKOK$ = "n" GOTO 410
510 MX(K) = TXMT(K)*CATXRT*100: MTX(K) = CINT(MX(K))    '**Poundoff Tax**
520 CTX(K) = MTX(K)*.01
530 TM(K) = LBMT(K) + NTMT(K) + TXMT(k) + CTX(K)
540 MT=MT+TM(K):MCT=MCT+CTX(K):MTX=MTX+TXMT(K):NEXT K
550 REM  *******ENTER CLIPPING SERVICE, POSTAGE, TELEPHONE DATA******#
560 INPUT "Is There A Clipping Service y/n";NECS$
570 IF NECS$ = "n" GOTO 590
580 INPUT "Clipping Service Amount";CLPSVC
590 INPUT "How Much Is Postage";POSAMT:INPUT "How Much Is Telephone";TELAMT
600 PRINT "What Is Telephone Billing Period?"
610 INPUT "From";FMTEL$
620 INPUT "To";TOTEL$
630 INPUT "Is Above Info OK y/n";BOK$: IF BOK$ = "n" GOTO 580
640 REM  **********STORE ENTERED DATA***********
650 INPUT "Is Disk In Drive B y/n";PDY$: IF PDY$ = "y" GOTO 670
660 LINE INPUT "WAIT--Insert Disk In Drive B And Continue"; CT$
670 OPEN "b:" +FINAM$ FOR OUTPUT AS #1:PRINT #1,".po 4"
680 PRINT #1,".pl 55":PRINT #1,TAB(58);DT$
690 PRINT #1,: PRINT #1,"Invoice For "; MOYEAR$: PRINT #1,
700 PRINT #1, AD$:PPINT #1, TI$:PRINT #1, CO$:PRINT #1, ADDR$:PPINT #1, CSZ$
710 PPINT #1,: PRINT #1, TAB(30) "I N V O I C E"
720 PRINT #1, TAB(50) "Subtotal";TAB(67)"Total": PRINT #1,
730 IF NEB$ = "n" GOTO 760
740 PPINT #1, "BALANCE FORWARD:";TAB(65);
750 PRINT #1, USING "##,###.##";BAL:PPINT #1,
760 IF MSF$ = "n" GOTO 800
770 PRINT #1, "MONTHLY SERVICE FEE:";TAB(65);
780 PRINT #1, USING "##,###.##";SFAMT: PPINT #1,
790 REM **********STOPE PRESS PELEASE DATA**********
800 PRINT #1,:FOR N = 1 TO 20:IF APP$(N) = "n" GOTO 930
810 PRINT #1,  "PPESS PELEASE "; PPN$(N)
820 PRINT #1, PRT1$(N);TAB(41) "Write:"; TAB(47);
830 PRINT #1, USING "##,###.##";PWPT(N)
840 PRINT #1, PRT2$(N);TAB(35) "Non-Taxable:";TAB(47);
850 PRINT #1, USING "##,###.##";NTXMT(N)
860 PRINT #1, PRT3$(N);TAB(39) "Taxable: ";TAB(47);
870 PRINT #1, USING "##,###.##";TAXMT(N)
880 PPINT #1, "Mailed:  ";DRM$(N);TAB(39)   CA Tax:";TAB(47);
890 PRINT #1, USING "##.###.##";CATX(N);:PRINT #1, TAB(63);
900 PPINT #1, USING "$$##,###.##";TOT(N):PRINT #1,
910 NEXT N: PPINT #1,
920 REM **********STORE MISC. TASK DATA***********
930 PRINT #1,: FOR K = 1 TO 50: IF NEMT$(K) = "n" GOTO 1050
```

More →

Listing 2 continued.

```
940 PRINT #1, "MISCELLANEOUS TASK #";K;TAB(41) "Labor:";TAB(47);
950 PRINT #1, USING "##,###.##";LBMT(K)
960 PRINT #1, TKL1$(K);TAB(35) "Non-Taxable:";TAB(47)
970 PRINT #1, USING "##,###.##";NTMT(K)
980 PRINT #1, TKL2$(K);TAB(39) "Taxable:";TAB(47);
990 PRINT #1, USING "##,###.##";TXMT(K)
1000 PRINT #1, TKL3$(K);TAB(40) "CA Tax:";TAB(47);
1010 PRINT #1, USING "##,###.##";CTX(K);:PRINT #1, TAB(63);
1020 PRINT #1, USING "$$##,###.##";TM(K):PRINT #1,
1030 NEXT K: PRINT #1,
1040 REM *****STORE CLIPPING SVC, POSTAGE, TELEPHONE DATA******
1050 IF NECS$ = "n" GOTO 1080
1060 PRINT #1,: PRINT #1,"Clipping Service:";
1070 PRINT #1, TAB(63);:PRINT #1,USING "$$##,###.##";CLPSVC
1080 IF POSAMT = 0 GOTO 1110
1090 PRINT #1,: PRINT #1, "Postage:";TAB(63);
1100 PRINT #1, USING "$$##,###.##"; POSAMT
1110 IF TELAMT = 0 GOTO 1130
1120 PRINT #1,:PRINT #1,"Telephone ":"(from ";FMTEL$;" to ";TOTEL$;")";TAB(63);:
     PRINT #1,USING "$$##,###.##"; TELAMT
1130 OVTOT = PPT+MT+POSAMT+TELAMT+SFAMT+CLPSVC+BAL  **Overall Totals**
1140 PRINT #1,:PRINT #1, "Overall Total:";TAB(63);
1150 PRINT #1, USING "$$##,###.##";OVTOT
1160 TOTAX = PTX + MTX:  TCATAX = PCT + MCT   **Tax Totals**
1170 PRINT #1, : PRINT #1, TAB(30) "Total Taxable:";
1180 PRINT #1, USING "$$##,###.## ";TOTAX
1190 PRINT #1, TAB(31) "Total CA Tax:";
1200 PRINT #1, USING "$$##,###.##";TCATAX
1210 PRINT #1, "Terms:";PRINT #1,"Net 10 Days": PRINT #1,"Thank You"
1220 PRINT #1,"DAVIS MARKETING COMMUNICATIONS":PRINT #1,FINAM$
1230 CLOSE 1 :END
1240 REM ********LEGEND FOR OUTPUT DATA********
1250 REM  FINAM$    = Filename
1260 REM  DT$       = Billing Date
1270 REM  MOYEAR$   = Month-Year
1280 REM  AD$       = Addressee
1290 REM  TI$       = Title of Addressee
1300 REM  CO$       = Company
1310 REM  ADDR$     = Co. Street Address
1320 REM  CSZ$      = Co. City, State-ZIP
1330 REM  CATXRT    = California Sales Tax Rate
1340 REM  SFAMT     = Service Fee Amount
1350 REM  BAL       = Balance Forward
1360 REM  *****PRESS RELEASES*****                *****MISCELLANEOUS TASKS*****
1370 REM  PRT1$(N) = Title on Line 1          TKL1$(K)  = Description Line 1
1380 REM  PRT2$(N) = Title on Line 2          TKL2$(K)  = Description Line 2
1390 REM  PRT3$(N) = Title on Line 3          TKL3$(K)  = Description Line 3
1400 REM  PRN$(N)  = Release Number
1410 REM  DRM$(N)  = Date Release Mailed
1420 REM  PWRT(N)  = Write Cost per PR        LBMT(K)   = Labor Cost per Task
1430 REM  NTXMT(N) = Non-Taxable  per PR      NTMT(K)   = Non-Taxable per Task
1440 REM  TAXMT(N) = Taxable per PR           TXMT(K)   = Taxable per Task
1450 REM  CATX(N)  = CA Tax per PR            CTX(K)    = CA Tax per Task
1460 REM  TOT(N)   = Total Amt. per PR        TM(K)     = Total Amt. per Task
1470 REM  PPT      = Total Amt. All PR        MT        = Total Amt. All Tasks
1480 REM  PCT      = Total All CA Tax PR      MCT       = Total All CA Tax Task
1490 REM  PTX      = Total Taxable PR         MTX       = Total Taxable Tasks
1500 REM  ********MISCELLANEOUS DATA**********
1510 REM  CLPSVC   = Clipping Service Amt.
1520 REM  POSAMT   = Postage Amt.
1530 REM  TELAMT   = Telephone Amt.
1540 REM  FMTEL    = From Date (Telephone)
1550 REM  TOTEL    = To Date (Telephone)
1560 REM  OVTOT    = Overall Total For Entire Bill
1570 REM  TOTAX    = Total Taxable For Entire Bill
1580 REM  TCATAX   = Total CA Tax For Entire Bill
1590 REM  APR$(N)  = Are There Any More Press Releases?
1600 REM  NEMT$(K) = Are There Any More Tasks?
1610 REM  MSF$     = Is There a Monthly Service Fee?
1620 REM  NEB$     = Is There a Balance Forward?
1630 REM  NECS$    = Is There a Clipping Service?
1640 REM  ************END OF LEGEND**************
```

the start of the loop; if the answer is no, you go to the question, "Is There A Clipping Service?"

The program continues with more questions about client charges. Instruction 670 causes the opening of a disk file to store formatted information. After this, data gathered in the entry portion of the program is then formatted and stored on the disk. As you can see, "PRINT USING" is used to provide figures with two decimal places. At the end of the program, overall totals are calculated.

Note that Instructions 670 and 680 include the WordStar dot commands ".pl 55" and ".po 4"; these set page length to 55 lines and page offset (left margin) to four spaces, respectively. Page length is reduced from 66 (default) to 55 lines to allow space at the top of the page for the logo. Page offset provides additional horizontal space for the tabular data.

Instructions 320 and 330 take care of round-off errors that can occur when calculating taxes associated with press releases. The taxable amount is in terms of dollars and cents, so it has two decimal places, and the tax rate of .065 has three decimal places. Therefore, their product has five decimal places.

If you don't round off the numbers to two decimal places for individual items, there is a possibility of a cent or two error in the total bill. You can avoid this by first multiplying the taxable amount by the tax rate and 100, yielding a number with three decimal places. Then, that number is rounded to a whole integer by "TX(N) =CINT (CX(N))" in Instruction 320.

Finally, a two-decimal place number is obtained by multiplying TX(N) by .01 in 330. A similar procedure is followed in Instructions 510 and 520 for the miscellaneous tasks. Without this rounding, a difference can occur.

Another feature of data formatting is elimination of major items when their data entry is zero. For instance, you don't want to print a "Balance Forward" of zero, or a "Monthly Service Fee" of zero. Therefore, it is best not to print anything in these cases.

> This IBM program eliminates the possibility of a cent or two error in the total bill.

For example, if there is no balance forward in Instruction 730, the program jumps to Instruction 760 and eliminates the printing of "Balance Forward." The same situation occurs for the monthly service fee, clipping service, postage and telephone. This is done primarily to simplify the printout.

Using the System

In using the system, I copied WordStar, MailMerge and Basic onto the same disk. Then, I developed and stored the logo and billing programs on the same disk. The logo-billing disk is used in drive A and a working disk is used in drive B to store billing data. After the data is stored on the working disk, it is reviewed and edited using WordStar.

When satisfied that the billing information reviewed by use of WordStar is all right, the computer is transferred to the disk operating system and put in the Basic mode. Then, the logo program is loaded, the program is run and the logo is printed. Next, the system is returned to the DOS mode and WordStar is put in the print mode, the appropriate filename is entered and the invoice is printed. A different filename is used for each client, and completed billing information is available on disk for future reference.■

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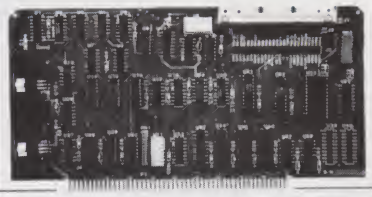

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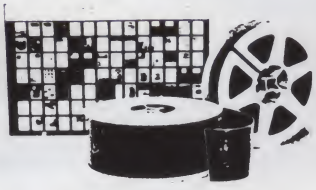

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Survival Kit For Printer Buyers

After a brief hiatus, this review series is back by popular demand. This month we review the high-speed, dot-matrix DS180 printer from Datasouth.

By Jim Hansen

Before continuing this series, I would like to thank all of you who have written to me and to *Microcomputing* about these articles (see the March, May and June 1982 issues of *MC*).

One of the two major benefits of writing reviews is reader recognition and comment. The other? Getting a chance to play—often for free—with state-of-the-art equipment. Thanks to your letters (more than 150 in all), this series will continue as long as we can find printer manufacturers willing to let me comment on their products. . . without pulling punches.

A DS180 Introduction

This month's printer is the Datasouth DS180. This 180-character-per-second printer is designed for medium-duty printing applications. It features a nine-wire dot matrix printhead and prints characters in a 9 × 7 cell, providing true descenders for lowercase letters.

The printhead is organized so all nine wires are in a single column. The printed character height (above the baseline) is about .1 inch with no dot overlap. The head is rated at 650 million characters.

The ribbon (about ½-inch wide) is cartridge-loaded. The cartridge is carried on the head carriage, much like ribbons are carried on the IBM Selectric typewriter. The ribbon path follows a straight line across the printhead and is not skewed. Its estimated life is "nearly" four million characters. The ribbon is driven with power taken from the head carriage drive system.

The printer is rated to handle forms up to six parts deep for business applications, and will take paper or label stock three to 15 inches wide.

The DS180 prints standard characters, ten per inch; a "compressed character option" allows printing at 12 and 16.5 characters per inch. Double-width characters also may be printed.

If the printer is equipped with the graphics option, it can print pictures, charts and graphs with resolutions of 75 dots horizontally by 72 vertically —nearly symmetrical.

The printer configuration is programmable from a front control panel or by use of escape sequences. The DS180 stores the configuration of the printer into a battery-powered, nonvolatile memory whenever the unit is turned off, and restores the configuration when turned on again. There are no hidden DIP switches buried inside the unit.

Measurements

The DS180 printer measures about 24 inches across the front, is 16 inches deep and about eight inches high. The manual gives no weight specification, but I would guess it to be about 15 pounds, making the printer a manageable armful to move about.

The case top is made of cream-white, heavy-duty, molded foam plastic, about the same color as Apple or IBM personal computers. The top is fitted with a flat plastic window with an acoustic seal around the edge; the window simply lies in a molded cutout, and is easily removed from the case when loading paper and changing ribbons. The inside of the top case is lined with acoustic foam to reduce noise.

Paper can be loaded into the printer from either a slot under the front cover or from directly up through the bottom of the base. The adjustment lever that controls paper thickness is located inside the window on the left of the carriage, and is easily located and set. No other user adjustments are required.

Technical Inspection

The printer mechanism is constructed on two 1/8-inch aluminum side plates. The head carriage is supported by two polished steel rails of ½-inch diameter. The platen (the

External view of the Datasouth DS180. The printer is about 24 inches wide, but it can be moved easily because of its lightweight construction.

Address correspondence to Jim Hansen, PO Box 234, New Boston, NH 03070.

metal rail behind the paper) is made of aluminum.

The carriage is driven open loop (no position feedback) by a stepper motor; the paper feed is driven by a stepper motor via a small timing belt and pulley reduction system.

The carriage bearings are made of oil-impregnated fiberglass tubing. The carriage itself is coupled to the stepper motor with a "dial cord" system using pulleys about an inch in diameter. The cord is tensioned by two springs located on the right side panel and a rather large spring mounted in a bracket on the left side. The ribbon cartridge is driven by power taken from the carriage; this is arranged by clever use of the dial cords, which make five passes between the two side plates.

The tractors, made of plastic, are similar to most others found on lower-cost printers. They are supported by a single .310-inch-diameter polished steel rod at the top and a square drive shaft of about the same diameter at the bottom.

The controller is microprocessor-based and is built on a single controller board about 16×8 inches. An 8085 (from Japan) controls operation. Two AMD 2732 EPROM chips provide 8K of storage for the character font and control memory. A Toshiba 2016 provides 2K of random-access memory for control and buffer storage. An onboard battery maintains memory on standby to allow retention of the settings of various programmable features of the printer.

All controller electronics, except the power transformer, main rectifier and bulk storage capacitors, are mounted on the controller printed-circuit card. A small fan mounted on the back apron provides some forced air circulation.

The motor drive transistors for the paper and carriage motors are mounted back-to-back on four heat sinks, each common to a pair of transistors. The nine needle-drive transistors are installed adjacent to the ribbon cable servicing the head.

A small amount of electronics is installed on the control-panel printed circuit board and connected to the main controller card with a 16-conductor ribbon cable.

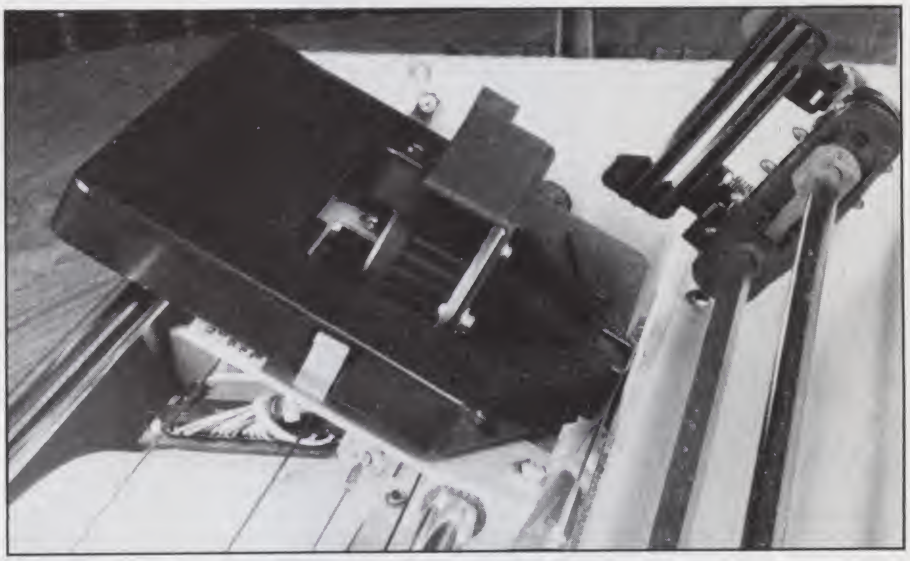
The DS180 provides both a Centronics-type parallel interface and an RS-232 and optional 20 mA current loop interface. The serial interfaces may be configured for either X-on or X-off operation or, in the case of the RS-232 interface, DTR operation.

The manual for the DS180 consists of 38 pages of single-spaced, typewritten text on 8½×11 paper. The manual includes no photos, and the only diagrams included show interface timing.

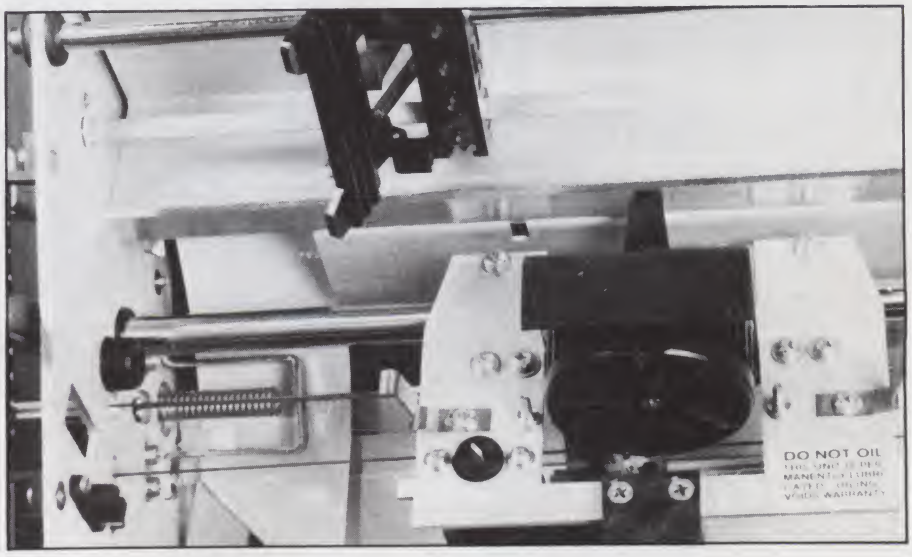
Printer Features

The DS180 is a "basic" printer, and, as tested, did not include an alternate character set. Judging from the manual, though, it is possible to have two character sets available. One of the difficulties I had in determining the features on this printer is that they have to be found by reading about all the control and escape codes processed; there was no "features" table included in the manual. So if I miss any important ones, my apologies to Datasouth.

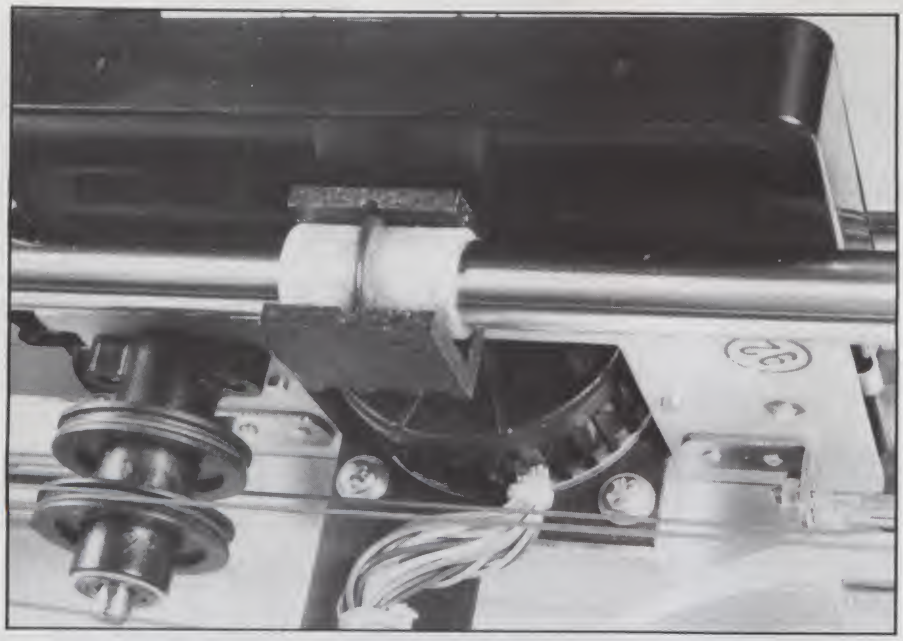
The DS180 prints at ten characters per inch only, unless double-width characters (at five per inch) are selected via the interface, or unless your printer is equipped with the "compressed print option," which



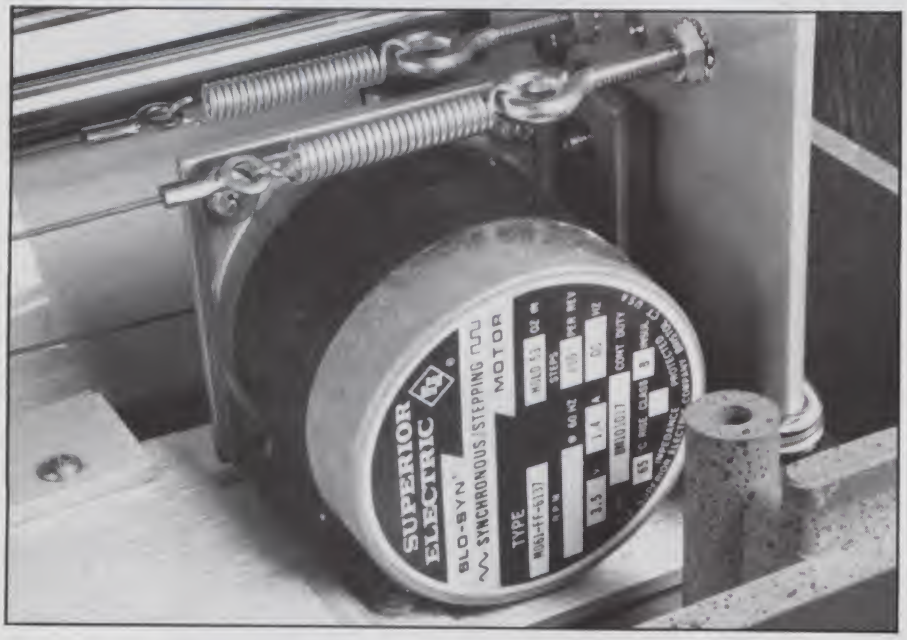
Head carriage assembly and ribbon cartridge. Since the ribbon is completely covered, except for the area just in front of the head needles, you won't get messy fingers when changing ribbons. The ribbon is supposed to last about four million characters and the head 650 million characters. The head is oriented at an angle to allow text to be easily read as it is printed.



Top view of carriage assembly and tractor with ribbon removed. The ribbon cartridge is driven by the metal tab protruding through the lower left section of the carriage base plate. The cartridge itself simply slips onto the carriage platform and is held in place with the two spring clips on either side of the base plate. The warranty violation notice about oiling the printer (bottom right) is not mentioned in any of the other documentation supplied with the printer tested, and is completely hidden from view when the ribbon cartridge is in place.



Underside view of the head carriage. The oil-impregnated fiberglass bearing shown here (there are two more on the front carriage rail) is held in place with an "O" ring. The two plastic pulleys (lower left) drive the ribbon as the carriage moves.



A view of the carriage drive motor and drive cord tensioner springs. Datasouth chose to use American-brand stepper motors with Japanese microprocessor components. Notice the paint splattering on the inside of the case around the mounting post, a cosmetic issue only.

allows 12 and 16.5 characters (and double-width versions) per inch to be printed as well. Provisions for setting form lengths, horizontal and vertical tabs, left and right margins, top and bottom form margins and baud rates are other available printing features.

There are 22 additional discrete features programmable from the control panel with, for the most part, escape sequences over the interface. These particular features can activate X-on and X-off serial interface features, inhibit or enable print and select double-width printing. Also provided are various communication mode features, auto linefeed or carriage return capabilities and a lines-per-inch selection (six or eight) feature. In addition, the control panel can set the top of a form and activate an alternate character set (if available), the graphics mode (optional) and self-test. One feature useful to communications people and not available on most printers allows printing control codes (rather than performing the function called for by the code).

The serial interface allows operation on all standard baud rates from 110 to 9600 baud, plus 450 baud, a speed I haven't been exposed to. The printer is restricted to baud rates 4800 and below if it is printing 12 characters per inch (and presumably 16.5 as well). I did not test this restriction and the manual gave no details.

Subjective Comment

The DS180 is a solid, well-built unit that is nearly stark in mechanical execution. True appreciation of the design will come after a little study . . . in fact, my first impression after seeing the two eyebolts used to anchor the carriage drive cords (see photos) was that they were from the dime store. But after considering alternatives for an adjustable cord tensioner, this turns out to be an elegant, low-cost solution. It works, won't break and is cheap—good for nine points in engineering law.

```
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
```

Fig. 1. A print sample from the Datasouth DS180. The font is well-designed and easy to read, and typical of dot-matrix line printers. Characters are about .1 inch high and have true descenders. Also shown are some control codes printed in a "transparent" mode, useful to those dealing with telecommunications.

Circle 266 on Reader Service card.

Circle 46 on Reader Service card.

Circle 16 on Reader Service card.

The unit is surprisingly light, due largely to the widespread use of aluminum in its frame. But at the same time, it's wonderfully rigid. The platen, also made of aluminum, is much softer than the print wires in the head. (Users should avoid situations where the printer goes past the paper and prints directly on the platen.)

It's exceptionally easy to load and adjust paper because of the wide throat clearances going into the printer as well as the completely open carriage area. The only printer adjustment to be made by users is the paper-thickness lever, also easily reached.

I especially liked being able to read copy as it was being printed. The window of the DS180 simply lies flat in a rubber-lined cutout in the top section of the cover. At this angle, most objectionable reflections and glare from overhead lighting are minimal.

The window also serves as the "tear bar" whenever paper is to be removed from the printer. This turns out to be a minor nuisance because it must be held down with one hand while you tear paper with the other. (The window, remember, just lies in its cutout in the case. I suspect that it will be occasionally dropped and broken or scratched, if not lost, in the course of normal operation.)

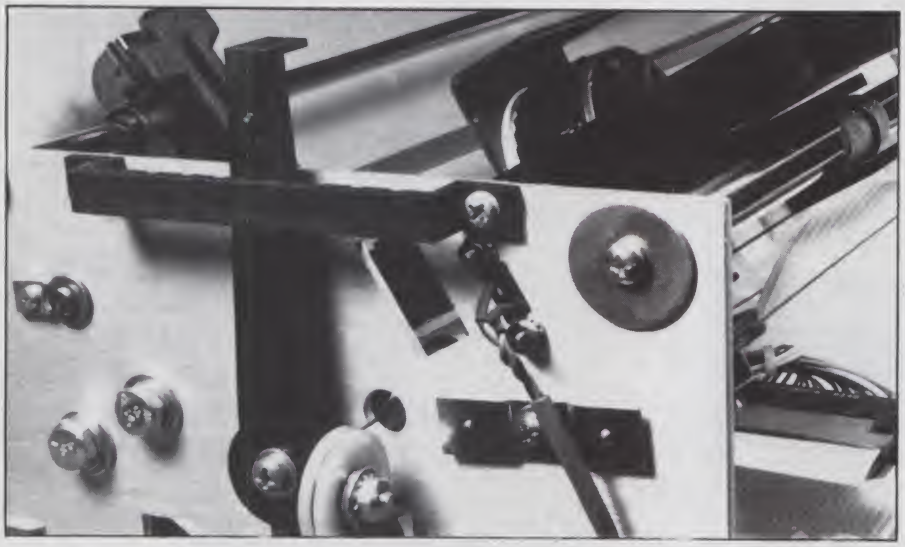
The noise level of this printer is fairly high during operation. I did not get a chance to actually measure it, but it is much louder than most typewriters, and is probably in the 80 dB range in spite of the obvious attempt to quiet the unit with acoustical padding.

The printer "bell" is an electronic beeper. It is not overly loud, and even with the window off, you may not notice it over the noise of normal printing. It is located inside the case, and the sound-deadening material is apparently effective at the bell frequency.

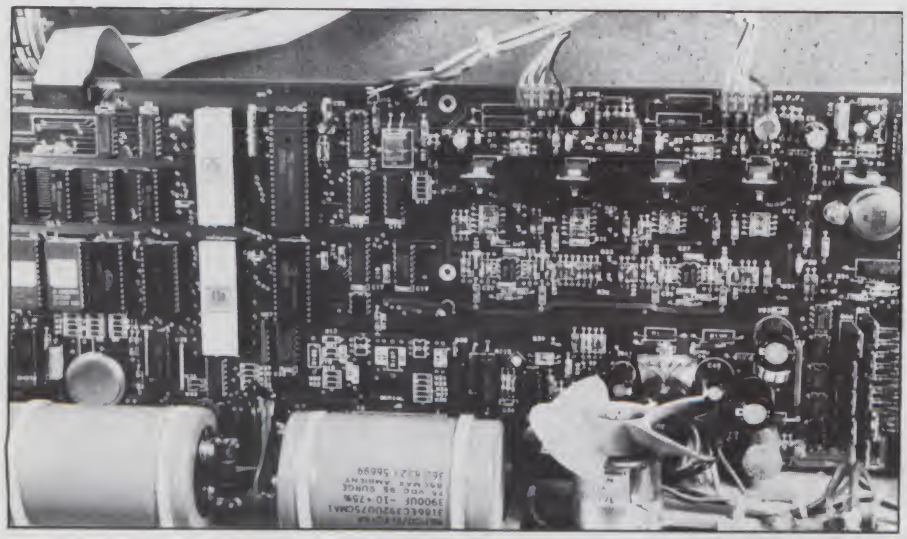
The print quality of the DS180 is excellent, but, due to the font, it's of obvious wide-spaced dot-matrix origin. There is no dot overlap; this, combined with the inability to take any paper other than pin-feed stock, relegates the DS180 to the line printer class, where overall print detail is sacrificed for speed. The baseline of the lowercase characters is raised above that of the uppercase font. This allows increased character height for additional clarity, but still provides two-dot lowercase descenders.

The controller layout is uncluttered and components are well-spaced for good head dissipation. Unusually large heat sinks are provided for the motor drive transistors. The five-volt supply is switcher-regulated, reducing the amount of heat generated *inside* the printer case. From external appearances, the controller has been conservatively designed.

I like knobs to move paper. Push-button electronic systems for moving paper seem unresponsive and too slow for me. Such is not the case with the DS180; paper slews forward at a satisfactory rate, but in one direction only. You cannot back up the paper in slew mode, so if you have gone past your target, you probably will waste another page rather than move the paper back at the form-setting speed (one poke of the button per 1/48-inch), or by unloading it from the tractors.



View of left side plate. The paper-thickness lever can be adjusted to allow up to six-part sheets of paper to be used in the printer. The wire shown going to a slot in the side plate connects to an optical sensor, which detects when the carriage is at the left-most allowable position.

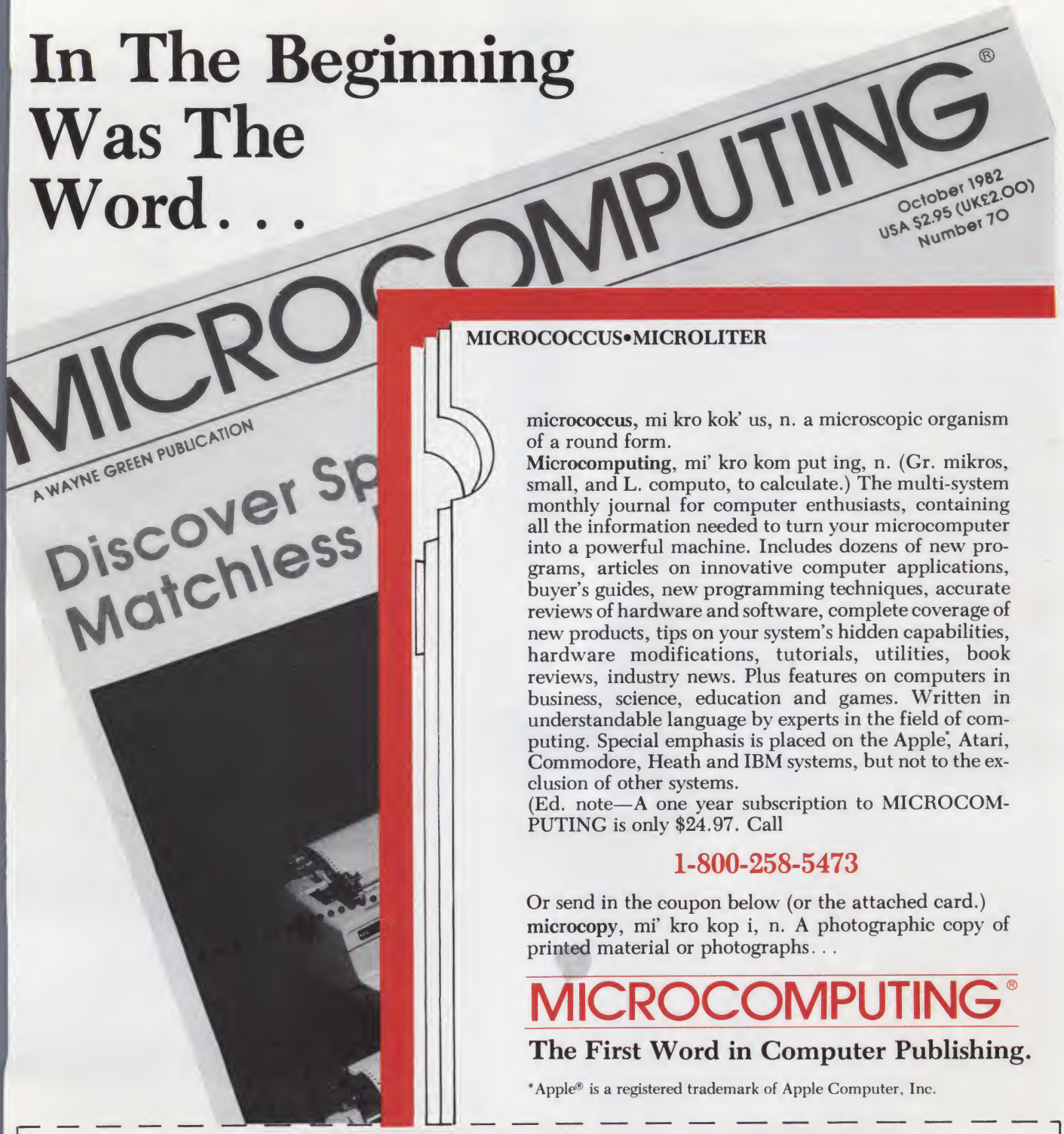


The controller board of the DS180. The microprocessor area is in the left one-third section of the board; the round object shown just above the left bulk capacitor on the left is the battery used to maintain the control settings of the printer when it is turned off. The head needle drivers are on the bottom right of the board, and the cables for the motors, the paper and carriage home sensors and the control panel connect on the top edge of the circuit board. Although the board is wide open and well-spaced, the component legends are often printed under the component they identify. This is certainly no problem for the user, but a pain to service centers.

DS180 User's Manual

I was not impressed with the manual. It's the type that instructs you to inspect the carton for damage, set it on the floor, open it and then "remove loose items (manual, ribbons, etc.)." Give me a break. If I hadn't already done all that, I wouldn't be reading the manual, would I?

In The Beginning Was The Word. . .



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Although cleanly printed, the manual is clearly intended to be used by people who enjoy wading through documentation to find one item of interest. It is not user-friendly, and little effort was spent to make it easy to use.

I tried out most of the programming options, however, to get a feel for the use of the control panel, and found everything I used was accurately described. I had no trouble understanding what was meant, but I think that beginners or inexperienced users will have difficulty with this manual (at first).

The introduction of the manual mentions "simultaneous underlining" (meaning, I presume, that you can "turn on" underscore and not have to program a second pass), but I couldn't find any other mention of this feature.

I was concerned about the control panel when I first looked at it, and even more concerned after using it. It's complicated to use because there are up to 50 variables that can be controlled or set, and unless you have the manual at your fingertips (or unless you have a photographic memory), there is absolutely no way to set any parameter. Additionally, parameters, depending on what they control, are set using different procedures.

Generally, a parameter is set by first taking the printer off line and then by pushing Enter. At this time, the Set Up light flashes and function code 01 is displayed. You must select the function number you want by pushing a button marked "DSP" with an up or down arrow. (The function numbers wrap at 50—the highest value—so you can go backwards to get to the high numbers more quickly.)

Once the function number is displayed, you may or may not have to press the Value button. The parameter value can now be set with the up and down arrows or the Set and Clear buttons. I found the procedure one that probably will take some practice and experience before it can be done with confidence.

If all the concern I have expressed over the control panel makes it sound bad, it isn't. But it's certainly more complicated than the usual DIP switch operations. Users will probably develop a canned program that automatically sets up the printer over the interface anyway. The manual, however, had better be kept in a safe place where it can't get lost.

The Graphics Mode

I did not test the graphics mode of operation, since it did not offer any significant departure from other printers that print graphics. The mode is enabled by setting a function from the front panel; after this, the printer can be placed in the graphics mode by sending an ASCII FS character (CHR$(1)). All characters sent afterward with bit 7 sent are processed as graphics. (This means that the lowercase ASCII characters are printed as graphics.)

The graphics mode is exited by sending a number between 0 and 9; this also moves the paper up by that number of dots. If there are more dots sent than there is room on the line, the leftovers are thrown away. This is a good graphics implementation, although I would like to have seen the printer perform automatic line-wrapping (which is handy when doing screen dumps).

The vertical and horizontal resolution is about average, but more importantly, nearly symmetrical. Circles plotted on this printer will be about four percent out of round with no compensation by the host computer —hardly noticeable.

Line Length	Throughput in Characters/Second
20	86
60	133
100	153
130	162

Table 1. Throughput tests results. The DS180, rated by Datasouth as an 180-character-per-second printer, prints bidirectionally with logic-seeking, which means it will go to the end of the next line closest to the head and print the line in the appropriate direction. I ran very basic throughput tests at ten characters per inch, using the serial interface at 9600 baud; I came up with the following figures. If your typical line length were, say, 50 characters long, the DS180, with its 1000-byte buffer, could probably keep up with 1200 baud transmission without any handshaking required.

Wrap-up

I like this printer for what it is—a basic, rugged unit for line printing applications. It is mechanically simple, and should give years of reliable service. If you have an application where such a printer is required, I think you should consider the DS180 as a possible solution.■

Calculator-Like Input For Basic

Throw away your calculator! Use this PET Basic program instead for numerical calculations.

By John E. Wampler

How many times have you seen someone sitting in front of a computer console with a calculator in hand? Often this is because the program he is using requires an input that must be calculated. Of course, if this happens often enough and the program is easily changed, the calculation will be made part of the program. On the other hand, any programmed calculation will then become fixed at run time and restricted to the scale and units anticipated by the programmer.

The input routine in Fig. 1 can be incorporated into a Basic program to allow run time calculations and selection of preassigned variables as inputs. The call to this subroutine is used in the program in place of the Basic input statement. Since it requires several setup instructions—assignment statements for the prompt and allowed range—as well as an assignment statement for the result of the input, it is not a good substitute for inputs in small programs. It is, however, an advantageous way to incorporate a flexible form of numerical input into a larger program.

Numerical inputs that pass through this routine are tested for whether or not they are in an allowed range. Their input is preceded by a prompt, and any input can be calculated at run time or derived from any of ten preassigned variables. A more subtle advantage is that the programmer or the program can vary the source of the input by simply changing, at one instruction site, from the keyboard to any other source of ASCII characters (such as a disk file, a communications port or even a string stored within the program).

Subroutine Operation

You enter numbers in sequence, separated by operation symbols (+, −, * or /), as you would with a simple calculator. For example, 23*4.2 might be input and then terminated by pushing the enter key (or return). When the entry is terminated, the "calculator" displays the result, =96.6. As with a simple calculator, there is no mathematical hierarchy —that is, each operation is carried out in the same sequence in which it is input. Another example illustrates this:

INPUT ? 2.3+14*4−6↓=59.2

Here, the prompt and the result printed by the program are underlined. The user's input is not. The terminating "enter" character is symbolized by the ↓. 2.3 is added to 14 *before* the result is multiplied by 4, whereas in a Basic assignment statement 4 times 14 would be added to 2.3.

Any one of ten preassigned variables, K0 through K9, can be entered as part of the input string. The user specifies by name the constant he wants to use. Two of these constants have special functions. K0 always contains the value of the last input and K1 can be specified by typing K without any number. For example, if K1 has a value of 3.1416, K2 a value of 2 and K4 has been assigned the value 10, each of the following would be valid inputs to this subroutine:

INPUT ? 2*K1↓=6.2832
INPUT ? 2*K↓=6.2832
INPUT ? K/K2*K4↓=15.708
INPUT ? K0↓=15.708

The constant K1 also has the special function that it can be used automatically; for example:

INPUT ? *2↓=6.2832
INPUT ? /2↓=1.5708
INPUT ? 2/↓=0.63661828
INPUT ? 2+↓=5.1416

As shown in these examples, multiplication by K1 can be done in either order and it may be used as either the divisor or dividend. However, it can only be automatically added to or subtracted from a previous entry or result. This is because of the ambiguity that would occur if −2 could mean both the negative value −2 or the result of K1−2.

The flowchart in Fig. 1 represents the algorithm used to achieve these functions. It is implemented in PET Basic language in Listing 1. The simple test program of Listing 2 illustrates its functions. As shown in Listing 2, the calling program supplies a

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string which is used to prompt the input, L$, and a lower and upper limit on the value of the final input result. These are V3 and V4 in this example. The result is returned in N1 and in the first variable storage slot K(0). To the user this is constant K0.

Referring to Listing 1, you can see that when it is called, the subroutine initializes N1 to be one and initializes the operation flag, O, to be 3, which stands for a multiplication. Thus the first operation performed is to multiply the first numerical value by 1. Line 1504 prints the prompt and acquires the input string of characters from the user. If the routine is to be driven by another source of characters such as a disk file, this line would be changed appropriately. V1 stores the length of the total input string and V2 is the current character position. The subroutine at 1590 uses V2 to extract single characters from the input string. When this routine runs out of characters, it returns a null character. It also ignores spaces (line 1594).

In order to implement the special automatic features using K1, the first non-space character is examined separately (lines 1505 through 1507). If it is * or /, then N1 is reinitialized and the operation is changed if necessary.

Each cycle of the simple parser (lines 1510–1574) acquires a numerical value from the input string into the variable N2 and then executes a Basic statement N1=N1 op N2, where op is either addition, subtraction, multiplication or division as signified by the value of the operation flag, O. Lines 1510–1528 acquire the value of N2 from the input string (S1$), either as a selected constant or as a numerical value that is converted by a VAL (S2$) statement (line 1545). The flags, U3 through U5, keep the routine honest, allowing signs, decimal point and exponent designation only when they are properly placed in the input string. If these characters are out of place, the error message of line 1574 is printed and the entire input request process is repeated.

Any character which is not a number or a properly placed part of a number terminates the numeric value input. The value of N2 is then converted from the temporary string, S2$. If the terminating character is a null (i.e., the end of the string), the specified operation is carried out and the subroutine returns to the calling routine via lines 1575–1579. Here the value of the result in N1 is tested to see if it is in the allowed input range. If it is, K(0) is also assigned this value. If it is not, then the error message of line 1575 is printed and the input process is started all over again.

If the terminating character for one number is an operation symbol, the proper value of O is assigned and the next number is decoded. When a K is detected as the first character in a numerical value (line 1521), as defined by the K flag, U2, the particular constant requested is decoded in lines

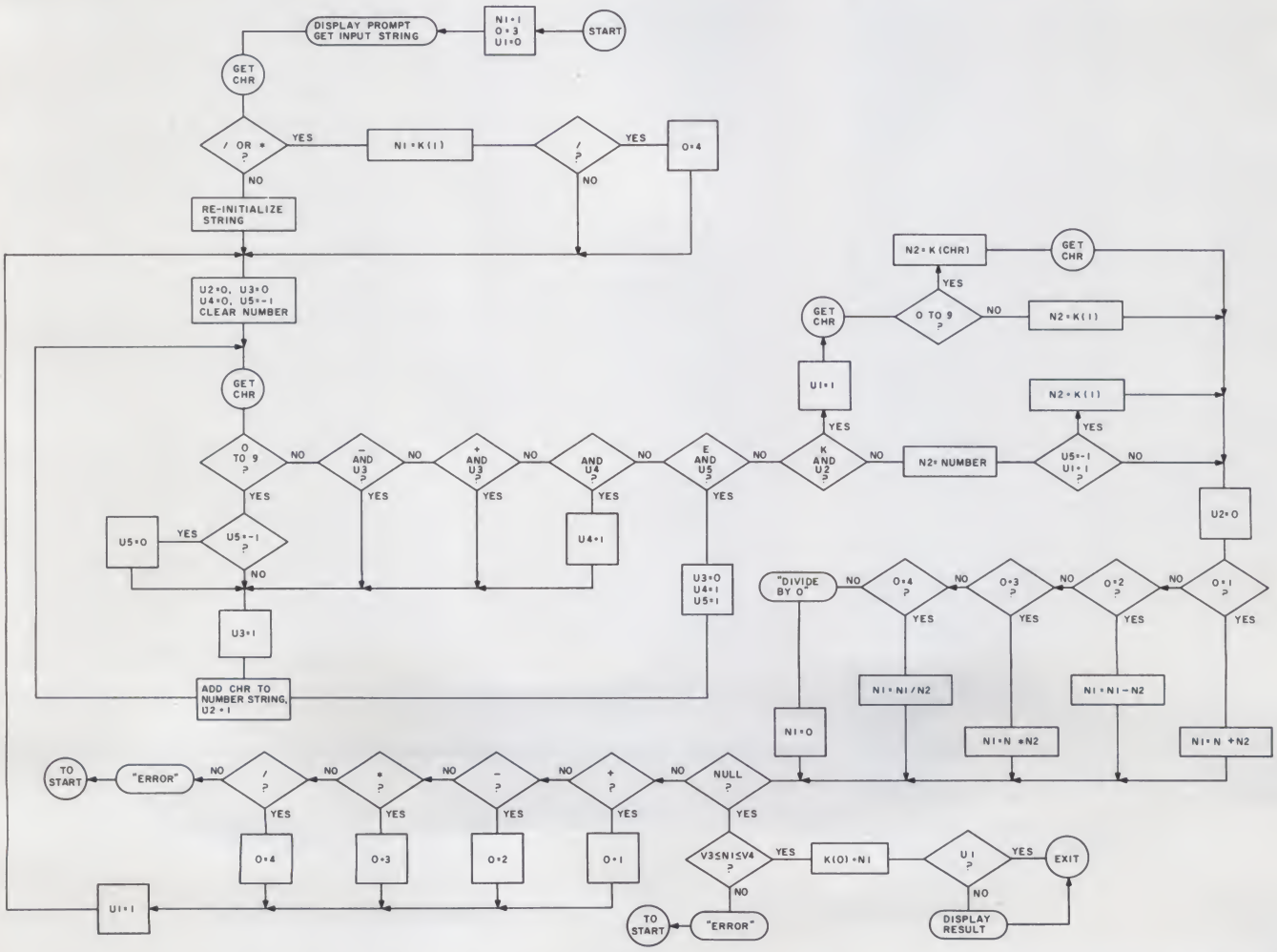

Fig. 1. Flowchart of the calculator-like input routine. In the flag tests of U1 through U5, the normal positive test is for the flag to have a value of zero. Any other required value for a positive test is specifically stated (e.g., U5 = −1). The GET CHR subroutine call must return the next character, CHR, from the input string or return the null character when it encounters the end of the string; this subroutine also must ignore spaces in the input string.

1580–1586.

Automatic terminal operations with K1 are detected by line 1547. U5 is the exponent flag. It is −1 only if a terminator is detected without a number being assigned. If an operation has previously been specified, however, U1 will be 1. So the combination, U5 = −1 and U1 = 1, signifies automatic operations involving K1.

The algorithm illustrated by Fig. 1 is based on the input routine of SPECOS, the Spectroscopy Operating System, developed by the University of Georgia's Instrument Design Group for instrument control computer systems. It has been implemented in Nova machine language (Data General Corp.) and in several versions of Basic.

The routine in Listing 1 will run in the Commodore PET or the Intecolor 3621 personal computer without change. For the PET, the semicolons in lines 1575 and 1577 are not necessary. With other versions of Basic, various changes are necessary. For an HP-85, for example, all of the colons used to construct multiple instruction statements must be replaced by the at sign (@).

In addition, all print statements must be converted to DISP statements; the ampersand (&) is used instead of the plus sign to concatenate the string in statement 1520; and the characters must be extracted from the input string, using the statement S3$ = S1$ (V2,V2) in line 1592 instead of the MID$ function. ■

```
1500 REM CALCULATOR LIKE INPUT ROUTINE
1501 REM INITIALIZE 1ST NUMBER, OPERATION, CALCULATION FLAG
1502 N1=1:O=3:U1=0
1503 REM PRINT QUIREY, INPUT STRING, SET LENGTH & CHR COUNT
1504 PRINT L$;:INPUT S1$:V1=LEN(S1$):V2=1
1505 GOSUB 1590:REM GET THE LEAD, NON-SPACE, CHARACTER
1506 IF S3$="*" OR S3$="/" THEN N1=K(1):U1=1:GOTO 1571
1507 V2=1:REM IF IT WASN'T * OR /, START OVER
1509 REM INITIALIZE NUMERIC PARSER FLAGS, CLEAR CONVERSION STRING
1510 U2=0:U3=0:U4=0:U5=-1:S2$=""
1515 GOSUB 1590:REM GET A CHARACTER IN S3$
1516 IF S3$<"0" OR S3$>"9" THEN 1521
1517 IF U5=-1 THEN U5=0:REM CLEAR E FLAG ONCE NUMBER
1519 U3=1:REM SET THE SIGN FLAG
1520 S2$=S2$+S3$:U2=1:GOTO 1515:REM BUILD STRING, SET K FLAG
1521 IF S3$="K" AND U2=0 THEN U1=1:GOTO 1580
1522 IF S3$="-" AND U3=0 THEN 1519
1524 IF S3$="+" AND U3=0 THEN 1519
1526 IF S3$="." AND U4=0 THEN U4=1:GOTO 1519
1528 IF S3$="E" AND U5=0 THEN U4=1:U3=0:U5=1:GOTO 1520
1545  N2=0:IF S2$<>"" THEN N2=VAL(S2$)
1547 IF U5=-1 AND U1=1 THEN N2=K(1)
1550 U2=0:IF O=1 THEN N1=N1+N2:GOTO 1565
1552 IF O=2 THEN N1=N1-N2:GOTO 1565
1554 IF O=3 THEN N1=N1*N2:GOTO 1565
1556 IF O=4 AND N2<>0 THEN N1=N1/N2:GOTO 1565
1560 PRINT "DIVID BY ZERO!":N1=0
1565 IF S3$="" THEN 1575
1567 U1=1:IF S3$="+" THEN O=1:GOTO 1510:REM GET NEXT NUMBER
1569 IF S3$="-" THEN O=2:GOTO 1510
1571 IF S3$="*" THEN O=3:GOTO 1510
1573 IF S3$="/" THEN O=4:GOTO 1510
1574 PRINT "ERROR AT CHAR. ";V2-1:GOTO 1500
1575 IF N1<V3 OR N1>V4 THEN PRINT "ALLOWED RANGE, ";V3;" TO ";V4:GOTO 1500
1577 K(O)=N1:IF U1=1 THEN PRINT " = ";N1
1579 RETURN:REM RESULT IN N1 AND K(O)
1580 GOSUB 1590:REM ASSIGN CONSTANTS
1582 IF S3$<"0" OR S3$>"9" THEN N2=K(1):GOTO 1550
1584 N2=K(VAL(S3$)):GOSUB 1590:GOTO 1550
1586 REM LEAVE WITH N2=CONSTANT, S3$= NEXT CHAR.
1590 IF V2>V1 THEN S3$="":RETURN
1592 S3$=MID$(S1$,V2,1):V2=V2+1
1594 IF S3$=" " THEN 1590:REM IGNORE SPACES
1596 RETURN
```

Listing 1. PET Basic program to provide simple calculator-like input.

```
5 REM TEST OF CALCULATOR LIKE INPUT ROUTINE
10 DIM K(9):REM ARRAY TO STORE TEN CONSTANTS
15 K(1)=3.1416:K(2)=2:K(3)=3:K(4)=10:K(5)=25
20 K(6)=2.303:K(7)=75:K(8)=80:K(9)=99
25 REM ARBITRARY VALUES ASSIGNED TO K1 THROUGH K9
30 L$="INPUT":REM PROMPT
35 V3=-100:V4=200:REM ARBITRARY LIMITS ON INPUT
40 GOSUB 1500:REM GET NUMBER IN N1
45 GOTO 40
2000 END
```

Listing 2. Test calculator program.

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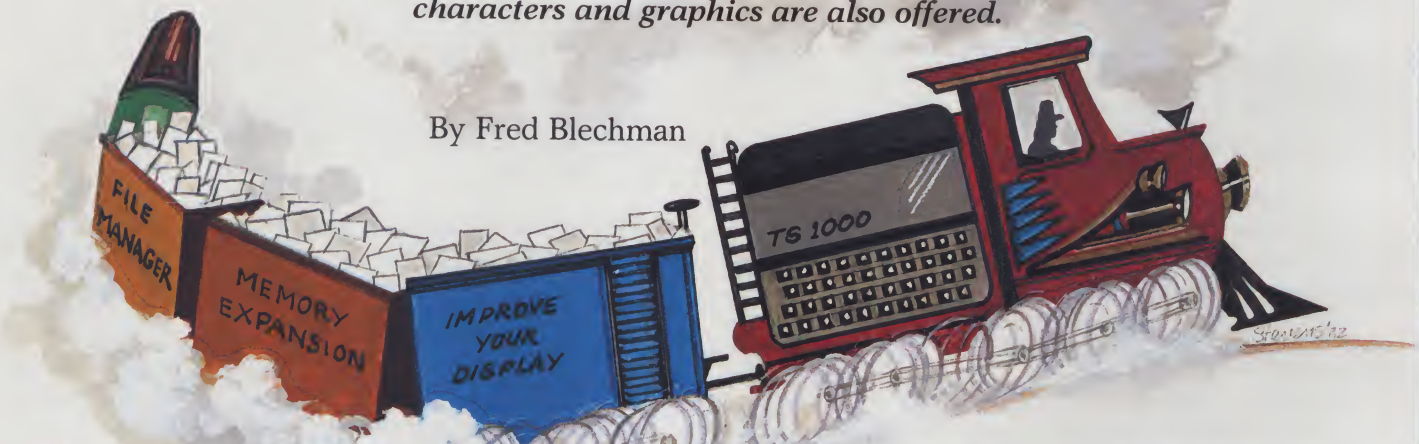
The Little Computer That Could

Microcomputing ***kicks off its special Timex-Sinclair section with this article that focuses on improving the TS-1000's screen display. Some programming techniques for formatting characters and graphics are also offered.***



By Fred Blechman

Your Timex-Sinclair 1000, or ZX-81, is of little value without a good TV display. This article describes some ways to improve the clarity and stability of the display itself and also discusses some programming techniques for formatting characters and graphics on the screen.

The ZX-81 Connection

Connecting the computer to a TV set can be confusing, so Fig. 1 is provided as an aid. Use a black-and-white TV set. A color set will work, but the display is generally much worse. Use the video game switch provided with the computer. Its exact design may vary from the illustration, but the connections are made as shown.

The important thing to remember is that the TV antenna should not be connected to the computer at any time, or you'll be broadcasting the computer signal around your neighborhood—a definite FCC no-no!

Both the computer and the TV set should be set to the same channel (VHF 2 or 3) and the video game switch should be set to "game" or "computer"—not TV.

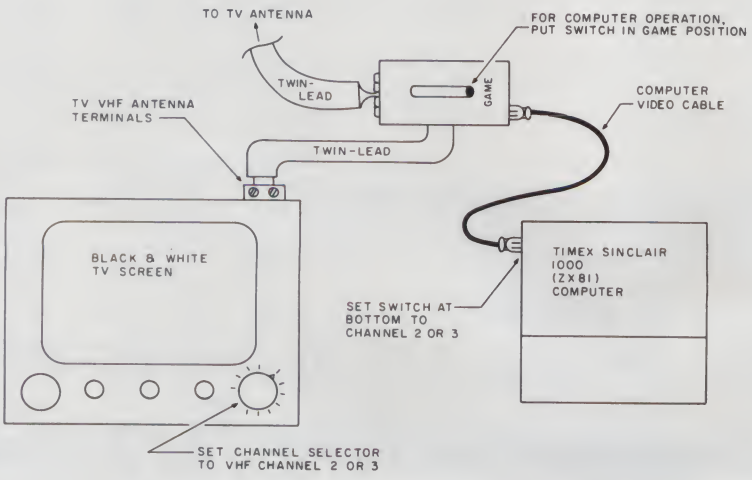


Fig. 1. Connecting your ZX-81 (TS-1000) to a television.

Display Limits

With the computer powered-up and the TV on, you should get a white screen with a small black block in the lower-left corner of the screen. Look closely at the box and you'll see a white letter K in the box. This is called the K-cursor.

Adjust your TV's fine tuning, brightness and contrast controls for the sharpest K. There is considerable interplay between these controls, and the best setting—the sharpest K—is not likely to be the same as you use for a regular TV picture. If you get horizontal pulling or tearing, adjust the TV's horizontal hold control. Vertical flipping can be adjusted by the TV's vertical hold control.

Some TV sets also have an AGC con-

In this section we refer to the ZX-81 computer from Sinclair. However, the computer is currently being manufactured and marketed under the name Timex-Sinclair 1000.

Address correspondence to Fred Blechman, 7217 Bernadine Ave., Canoga Park, CA 91307.

trol which can greatly improve the picture. Since there are no external adjustments on the computer, you'll have to do all the fine tuning with the TV.

Next, you'll want to determine the screen limits and vertical linearity—how constant the character size is from the top to the bottom of the screen. Running this simple program will fill your screen:

```
10 FOR X=1 TO 22
20 PRINT
   "12345678901234567890123456789012"
   (32 characters)
30 NEXT X
```

Notice that For, To, Print, and Next are not individual letters, but keywords shown on the keyboard. When you run this program, you'll get 22 lines of 32 characters each, then a blank line, then the report 0/30 in the lower-left corner of the bottom line. This defines the area of the screen you can use.

If the display is not approximately centered left to right, the horizontal hold will shift it slightly.

The vertical size and linearity controls (usually at the back of the set) affect the top and bottom borders and the vertical stretching or compressing of the picture.

If all else fails, and you're both brave and careful (high voltages present), you can remove the back of the TV set to find two metal "centering tabs" extending radially from the picture tube neck. These can be rotated slightly to center the picture.

The Display Layout

There are 704 printing locations on the screen for program characters—22 lines of 32 characters each. These are controlled by the various print commands and may be specified by row (top to bottom) and column (left to right). The two lines at the bottom of the screen are not available to the user; they are used by the computer for line entry, editing and reports.

Each of the 704 character spaces is divided into quarters called pixels. These pixels (each composed of four dots across and four dots high) are used with the Plot and Unplot statements, and their locations are specified with a different layout than the character spaces. Pixel locations use horizontal coordinates from 0 to 63 (reading from left to right) and vertical coordinates from 0 to 43, but reading from bottom to top! Fig. 2 illustrates character and pixel spaces, and numbering systems.

Beyond the scope of this article, but of vital concern to those with only 1K or 2K of user memory (RAM), is the fact that the display contents are part of RAM. The more you display on the screen (including blanks before the end of a line), the less RAM you have for your program! That's why you so often get the 4/XX out-of-memory report as the screen fills. This is not the case with 16K, which allocates a constant space of RAM to the display. Anyhow, don't worry—at least all the programs in this article work with 1K of RAM.

The Character Set

Now that you have a perfect picture (well, at least acceptable), your attention should be directed toward what you'll be putting on the screen and where you'll be putting it. The characters are the "what." The "where" is the location of these characters on the display.

The standard character set of the Timex-Sinclair 1000 and ZX-81 is composed of the alphabet (26 letters, uppercase capitals only), ten digits (0–9), 17 symbols and punctuation characters, and 11 graphics symbols (counting the blank space)—a total of 64. However, all of these are also available in reverse—a white character within a black block—for a total of 128. In reality there are 256 character codes, but many are not used in this computer and others are used as

tokens or keywords, as you'll see later. . .

At this point, let's concern ourselves with displaying just the regular characters and numbers. Refer to Fig. 2 for the following discussion.

Primarily, there are three ways to place and locate characters on the screen: Print, Print At and Print Tab, used with semicolons and commas. Look back at the simple program we used earlier. That program prints 22 full lines with 32 characters on a line, using the simple print statement. But there's more to Print than meets the eye! Type and enter a new line 20:

```
20 PRINT "TEST";
```

Don't forget the quotation marks or the semicolon. Now type RUN. Surprised? You have 22 test words on the screen in less than three lines. What happened? The secret is the semicolon, which prevents a return to the next line until the end of the line (32-character spaces long) is reached. Now change line 20 to this:

```
20 PRINT "TEST      ";
```

(Four spaces should follow TEST.)

Type RUN and see how nicely the four test words on each line are each separated by four blank spaces. You are beginning to practice formatting. Okay, try this:

Primarily, there are three ways to place and locate characters on the screen: Print, Print At and Print Tab.

```
20 PRINT "TEST",
```

(Don't forget the comma.)

Type RUN and you'll get two columns with 11 lines of TEST, each neatly lined up at the left side and center of the screen. The comma following a print statement effectively divides the screen into two zones, a left half (0 to 15) and a right half (16-31)—very handy for tabulations.

There are even more powerful print statements. Try this new line 20:

```
20 PRINT TAB 8;"TEST";
```

(TAB is a keyword.)

This indexes the beginning of the printing to the ninth space from the left (0 is the first space). Notice that the second semi-colon does nothing in this case, and may be omitted—but don't leave out the semicolon after TAB 8, or the computer will not allow you to enter the line. (You'll get an S-cursor at that point in the program line, meaning syntax error.)

By the way, did you have trouble figuring out how to get the tab function from the keyboard? The functions listed below the keys are obtained by pressing the shift key and the function key at the same time, followed by the key above the function you want. Don't use individual letters for Tab—it won't work.

Multiple Tabs are allowed. Enter this carefully:

```
20 PRINT "TAKE";TAB 8;"THE";TAB 16;
"TAB";TAB 24;"TEST. . ."
```

You should get four neat columns. Now, the real power comes when you use variables with Tab, for tabulations. Type NEW to erase the program in memory, and type in this one:

```
10 LET A=1
20 LET B=2
30 LET C=3
40 LET D=4
50 PRINT A;TAB 8;B;TAB 16;C;TAB 24;D
60 LET A=A+1
70 LET B=B+2
80 LET C=C+3
90 LET D=D+4
100 GOTO 50
```

When the counting gets to 88, the screen is full (22 lines) and the 5/50 report shows at the lower-left corner. Press Cont and then Enter to continue. Of course, you can combine text with variables in TAB statements. Pretty powerful, huh?

If you liked Print Tab you'll love Print At. Refer to Fig. 2 again. Delete your existing program by typing NEW and then type this:

```
10 LET Y=0
20 FOR X=0 TO 21
30 PRINT AT Y,X;"TEST"
40 LET Y=Y+1
50 NEXT X
```

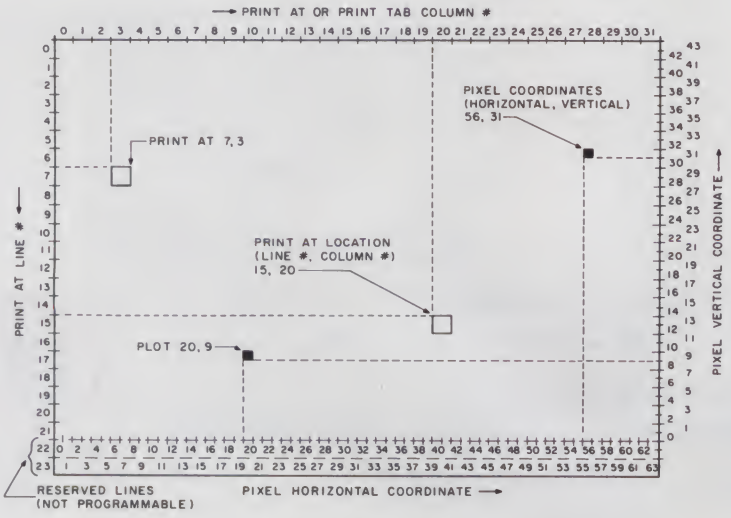
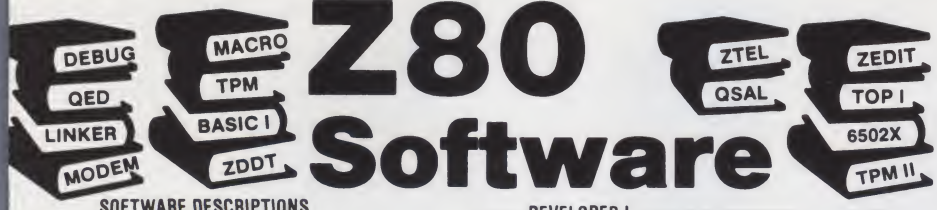


Fig. 2. An illustration of character and pixel spaces.



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Be careful that you use the function At (below the C-key) and not the letters A and T. You may, of course, use fixed values for Print At, rather than the variables in the program above. The new printing will replace whatever was on the screen. For example, add this line:

```
60 PRINT AT 11,7;"END OF TEST"
```

Any characters (numbers, letters, punctuation or symbols appearing on the keyboard), including their graphics reverse versions, can be used with Print, Print Tab and Print At. In combination with the semicolon and comma, you can format multiple columns on the screen and selectively erase desired areas on the screen using blank spaces.

Character Set Display

Here's a short program that will display the entire standard character set. First type NEW to delete your existing program, then type and enter these lines:

```
100 FOR X=0 TO 255 STEP 2
110 SCROLL
120 PRINT X;" ";CHR$X,X+1;" ";CHR$
    (X+1)
130 SCROLL
140 PRINT
150 NEXT X
```

The character code is X and the character (or keyword) is shown by CHR$. The scroll statement before each print statement forces the new printing to the bottom user screen line and pushes up all the lines above it. This eliminates the normal paging of 22 lines and allows continuous printing. The scroll statement, once used in a program, must be used before each following print statement or you'll get a "5" error (screen full).

You can avoid this by using the CLS (clear screen) statement after using Scroll. Line 120 (type it carefully!) puts two characters on a line, and lines 130 and 140 insert blank lines to increase readability.

How About Pixels?

Back to Fig. 2. Each character space is divided into four equal parts called pixels. The pixel statements Plot and Unplot use an entirely different coordinate system than Print At, since there are four times as many pixels (2816) as there are character locations (704). The tricky part is that the vertical pixel coordinate counts upward from the bottom of the screen. Furthermore, the horizontal left-to-right coordinate is given first, before the vertical. With Print At, the vertical location (row), counting from the top, is given first. Nothing like standardization, right?

This article just scratches the surface, but it should start you thinking about formatting whenever you have information or graphics to display.

Well, now that you have that down pat, here's a program that will continuously draw and erase a diagonal line:

```
10 LET Y=0
20 LET U=0
30 FOR X=0 TO 43
40 IF U=0 THEN PLOT X,Y
50 IF U=1 THEN UNPLOT X,Y
60 LET Y=Y+1
70 NEXT X
80 LET Y=0
90 IF U=1 THEN GOTO 120
100 IF U=0 THEN LET U=1
110 GOTO 30
120 LET U=0
130 GOTO 30
```

The variable U is used as a "flag." Initially, it is set to 0. When the For-Next loop from lines 30 to 70 is completed the first time, line 100 sets U equal to 1, so Unplot is used through the next loop. Then U is set back to 0 by lines 90 and 120 to resume Plot. The flag keeps flipping back and forth each time the For-Next loop is completed.

Is That All?

This article just scratches the surface, but it should start you thinking about formatting whenever you have information or graphics to display. Since the printer uses the copy function to make an exact copy of the display, you have additional incentive to learn formatting to produce more readable reports.

If you only have 1K or 2K of RAM, proper formatting will allow you to display more information with less display space, giving you more usable program memory.

There are other ways to put characters and pixels on the screen—strings and pokes, for example. These may be the subjects of a future article—when I figure out how to do them!■

Add a Keyboard

Next month *Microcomputing's* coverage of the Timex-Sinclair 1000 continues as author Jim Stephens focuses on adding a full-size keyboard to your TS-1000 (ZX-81).

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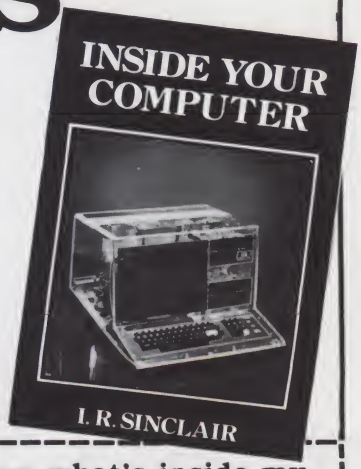

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A Small Wonder

Think the Sinclair "toy" computer is too small for serious applications? Well, here's a file manager program that lets you create, delete, list and retrieve records with the best of them.

by Russell King

Listing 1. File Manager program for the ZX-81 and TS-1000.

```
100  REM A LISTS PROGRAM FOR THE ZX81
200  REM MAIN MENU
210  CLS
215  SLOW

220  PRINT TAB 7;"THE LISTS PROGRAM"
230  PRINT
240  PRINT "1..ADD RECORD"
250  PRINT
260  PRINT "2..CHANGE RECORD"
270  PRINT
280  PRINT "3..DELETE RECORD"
290  PRINT
300  PRINT "4..LIST ALL RECORDS"
310  PRINT
320  PRINT "5..SEARCH FOR A RECORD"
330  PRINT
340  PRINT"6..SORT RECORDS"
350  PRINT
360  PRINT"7..SAVE RECORDS TO TAPE"
370  PRINT
380  PRINT"8..SET UP NEW LIST FILE"
390  PRINT
395  PRINT "9..LIST FIELDS"
400  PRINT
410  PRINT
500  PRINT "WHICH DO YOU WISH TO DO?";

510  INPUT A
515  LET A=INT A
520  IF A > 0 AND A < 10 THEN GOTO 560
530  CLS
540  PRINT "PLEASE CHOOSE 1-9"
550  GOTO 230
560  CLS
570  GOSUB A*1000
580  GOTO 210

1000 REM ADD RECORDS
1010 LET N=N + 1
1015 SCROLL
1020 PRINT "RECORD NUMBER ";N
1030 IF N<=M THEN GOTO 1060
1032 LET N=M
1035 SCROLL
1040 PRINT "NO MORE RECORDS CAN BE ADDED"
1050 GOTO 1920
1060 FOR I=1 TO N1
1070 SCROLL
1080 PRINT N$(I);
1090 INPUT I$(N,D(I,1) TO D(I,2))
```

More →

The ZX-81 (TS-1000) has opened the way for inexpensive computer power. In keeping with this short tradition, here is an inexpensive file manager for the price of the magazine.

Modesty prevents me from referring to this program as a database, but it is close to being one. (Some companies sell software programs similar to this one and do call them database programs.)

When the program (Listing 1) is run, a menu containing nine items appears. You select an item from the menu by entering the number of the item you want.

The menu allows you to add, change, delete, list, sort or search for records. You also may save the program and data records on tape, list the record fields that have been defined or define new record fields (this erases the records that are currently in memory). The program was defined using structured programming techniques to facilitate modification. I have also tried to minimize the number of entry keystrokes required as much as possible, because of the ZX-81's keyboard.

This program cannot perform arithmetic calculations on any data in any of the fields; it is designed only for lists.

Before describing the whys and hows of the program, I would like to comment on the machine itself. I bought the kit version of the ZX-81 and assembled it with no trouble, thanks to an earlier *Microcomputing* article describing the pitfalls another reader had encountered.

The only problem that I have is a poor connection to the 16K memory module; I lose the program in memory

Address correspondence to Russell King, 15 Fyfe St., Regina, Sask., Canada, S4X 1J7.

Listing continued.

```
1095 PRINT I$(N,D(I,1) TO D(I,2));
1100 SCROLL
1110 NEXT I
1120 SCROLL
1130 PRINT "CHANGE ANYTHING? ";
1140 INPUT A$
1145 SCROLL
1150 IF A$(1)="Y" THEN GOTO 1060
1160 SCROLL
1170 PRINT "RECORD ";N;" ADDED"
1180 SCROLL
1900 PRINT "ADD MORE RECORDS?";
1910 INPUT A$
1920 SCROLL
1930 IF A$(1)="Y" THEN GOTO 1000
1950 RETURN

2000 REM CHANGE RECORD
2010 SCROLL
2011 SCROLL
2020 PRINT "TO CHANGE A RECORD, YOU MUST"
2030 SCROLL
2040 PRINT "ENTER THE RECORD NUMBER FOR"
2050 SCROLL
2060 PRINT "THAT RECORD. DO YOU WISH TO"
2070 SCROLL
2080 PRINT "SEARCH FOR THE RECORD NUMBER?";
2090 INPUT A$
2095 SCROLL
2100 IF A$(1)="Y" THEN GOSUB 5000
2110 CLS
2120 SCROLL
2130 PRINT "RECORD NUMBER TO CHANGE: ";
2140 INPUT A
2145 LET A=INT A
2150 SCROLL
2160 IF A>0 AND A<=N THEN GOTO 2200
2170 PRINT "INVALID RECORD NUMBER"
2180 GOTO 2900
2200 FOR I=1 TO N1
2210 SCROLL
2220 PRINT N$(I);I$(A,D(I,1) TO D(I,2))
2230 SCROLL
2240 PRINT TAB 10;"CHANGE?";
2250 INPUT A$
2255 SCROLL
2260 IF A$(1)<>"Y" THEN GOTO 2300
2270 PRINT N$(I);
2280 INPUT I$(A,D(I,1) TO D(I,2))
2285 PRINT I$(A,D(I,1) TO D(I,2))
2290 SCROLL
2300 NEXT I
2800 SCROLL
2810 PRINT "FINISHED WITH RECORD ";A
2900 SCROLL
2910 PRINT "CHANGE OTHER RECORDS?";
2920 INPUT A$
2930 SCROLL
2940 IF A$(1)="Y" THEN GOTO 2000
2950 RETURN

3000 REM DELETE A RECORD
3010 IF N>0 THEN GOTO 3060
3020 SCROLL
3030 PRINT "NO RECORDS IN FILE"
3040 GOTO 3330
3060 SCROLL
3070 PRINT "ITEMS ARE DELETED BY RECORD"
3080 SCROLL
3090 PRINT "NUMBER. RECORD NUMBERS MAY"
3100 SCROLL
3110 PRINT "CHANGE AFTER AN ITEM IS DELETED"
3120 SCROLL
3130 PRINT "DO YOU WISH TO SEARCH FOR THE"
3132 SCROLL
```

More

if the machine is bumped. Attaching the memory module to the ZX-81 more firmly with a thick rubber band has alleviated this problem.

I had some trouble recording and retrieving programs with the tape player, but those problems seem to have disappeared. (I also make two copies of any programs I save now.)

Those who are not typists will find the ZX-81 easy to use, because every valid Basic statement (Print, Input, etc.) can be entered with only one or two keystrokes. Those of us who can type will have to suppress the urge to type out each word, as that results in syntax errors.

One of the best features of the ZX-81 is its editing capability. I found that editing on the ZX-81 is easier than editing on the Apple. Editing programs on the ZX-81 had to be made easy, or most owners would smash the machine in rage and frustration. It has been mentioned that there is no tactile feedback with the keyboard; this is true, but I have found that optic feedback works well.

If you put the ZX-81 into its Fast mode, the screen "blinks" each time a key is pressed. This blinking is noticeable even if you are facing the TV display, but not watching it. The blink can be seen out of the corner of your eye, and is as effective as a keyclick or tactile feedback.

Creating a Record Definition

Menu item 8 is used initially to create a record format. Each field in the record must be defined.

To see how the program will work, let's set up a sample address list (Table 1). Before using the program, you must determine how many fields you want, what information will be kept in each field, how long the field needs to be and what label you will use for each field.

The length of a label and field

Label	Contents	Length of Data Field (no. of characters)
Last	last name	10
First	first name	10
Street	street address	20
City	city	15
Prov/State	province or state	15
Post Code	postal or zip code	7
Phone	phone number	8

Table 1. Sample address list

together cannot exceed 31 characters. This restriction has been imposed to keep the display clean (i.e., the field label and the field contents must fit on one line).

The first thing the program asks is the name you want to use for the list. This name is used as a header when displaying record information; it is also the name by which the data will be stored in menu option 7.

Next, the program asks how many record fields you want. In the example there are seven fields, so enter 7. Then the program asks for the maximum number of characters in the description (label) field. Prov/State is the largest label field, with ten characters, so enter 10.

To make the display more readable, you can add spaces between the field label and the field contents by adding to the length of the field label. The program then calculates the largest data field possible, which is 21 (31 maximum, less label-field size of ten). Next, enter the labels (field descriptions) and the length of each data field. The program prints the maximum number of records that can be handled and asks how many records you want. This calculation is based on a 16K memory module being attached. If you have a 16K memory module, change line 8380 from 8000 to 56000 or thereabouts. After entering the desired number of records, memory will be set aside; then you can return to the menu to add records.

When entering a record, the program will prompt you by displaying the label for each field in the record. After entering all fields, you will be asked if you want to change anything. If you do, you will need to re-enter all fields for that record. Once the record has been entered and verified, you will be asked if you want to enter more records. Enter "Y" to continue adding records; any other response will return you to the menu.

Changing a Record

A record cannot be changed unless you know that record's number. The record number can be found by searching for it (menu option 5). Since the record number may change (if the records have been sorted or if a record has been deleted), you are given the opportunity to search for a record before changing it.

Once the record number is known and entered, the program will show you each field's contents and ask if you want to change that field. Any

Listing continued.

```
3135 PRINT "RECORD?";
3140 INPUT A$
3150 SCROLL
3160 IF A$(1)="Y" THEN GOSUB 5000
3170  SCROLL
3180 PRINT "RECORD NUMBER TO DELETE:";
3190 INPUT A
3195 LET A=INT A
3200 IF A>0 AND A<=N THEN GOTO 3250
3210 SCROLL
3220 PRINT "INVALID RECORD NUMBER"
3230 GOTO 3900
3250 FOR I=1 TO N1
3260 SCROLL
3270 PRINT N$(I);I$(A,D(I,1) TO D(I,2))
3280 NEXT I
3290 SCROLL
3300 PRINT "DELETE THIS RECORD?";
3310 INPUT A$
3320 IF A$(1)="Y" THEN GOTO 3360
3330 SCROLL
3340 PRINT "DELETE CANCELLED"
3350 GOTO 3900
3360 IF A=N THEN GOTO 3450

3400 FAST
3405 FOR I=A TO N-1
3410 LET I$(I)=I$(I+1)
3420 NEXT I
3430 SLOW
3450 LET N=N-1

3460 SCROLL
3470 PRINT "RECORD DELETED"
3900 SCROLL
3910 PRINT "DELETE ANY OTHER RECORDS?";
3920 INPUT A$
3930 SCROLL
3940 IF A$(1)="Y" THEN GOTO 3010
3950 RETURN

4000 REM LIST RECORDS
4010 SCROLL
4015 LET A=0
4020 PRINT "PRINT ALL RECORD FIELDS?";
4030 INPUT A$
4040 IF A$(1)="Y" THEN LET A=1
4045 SCROLL
4050 FAST
4060 FOR I=1 TO N1
4070 LET A(I)=A
4075 IF A=1 THEN LET A(I)=I
4080 NEXT I
4090 SLOW
4095 LET J=N1
4100 IF A=1 THEN GOTO 4220
4110 SCROLL
4120 PRINT "ENTER Y FOR EACH FIELD"
4121 SCROLL
4123 PRINT "YOU WANT PRINTED:"
4125 LET J=0
4130 SCROLL
4140 FOR I=1 TO N1
4150 SCROLL
4160 PRINT N$(I);" ?";
4170 INPUT A$
4175 PRINT A$(1)
4180 IF A$(1)<>"Y" THEN GOTO 4210
4190 LET J=J+1
4200 LET A(J)=I
4210 NEXT I
4220 SCROLL
4230 PRINT "PRINT TO SCREEN OR PRINTER(S/P)"
4240 INPUT A$
4250 IF A$(1)="P" THEN GOTO 4600
```

More

SORCERER BASIC COMPILER $69

The BASIC COMPILER is truly an amazing product! Now for the first time, Sorcerer users can join the many thousands of users who develop programs using a BASIC compiler.

WHAT DOES THE BASIC COMPILER DO?
The BASIC COMPILER is an assembly language program which translates a BASIC Source program into object code which may then be run at a speed comparable to machine code. At the time of compilation, the compiler converts constants to binary, enters variables into a symbol table, checks the syntax of each statement, resolves line number references and generates object code. When the object code is executed there is no further conversion of constants or searching for variables or line numbers. The object code is fully processed for immediate execution. An interpreter (such as the BASIC ROM PAC) is at a severe speed disadvantage because it must analyse each statement **every time** it executes the statement. It must convert constants to binary, search for variables and line numbers and analyse the syntax. Thus an interpreter does the two operations of analysis and execution every time a statement is executed. The BASIC COMPILER carries out the analysis only once (during compilation) and the generated object code may be immediately executed as many times as required or may be stored on cassette or disk for subsequent use.

BASIC COMPILER OVERVIEW
This compiler is a direct enhancement of the Sorcerer BASIC ROM PAC language. With the ROM PAC inserted, the user may load, RUN and debug his BASIC program then simply compile his code. The compiled program may be run and tested, then, if an error is found, the user may re-enter BASIC and edit the original source. All this may be done without having to save anything on cassette or disk!

DOCUMENTATION
The BASIC COMPILER comes with a full set of professional quality documentation, including:
- Specially made and printed quality ring binder.
- Over 55 pages of text.
- Full table of contents.
- Full explanation of all statement and functions including extremely clear description of constants, variables, operators and expression valuation.
- Page headings include chapter, section and subsection number for quick reference.

SUPPORT
SYSTEM SOFTWARE is one of the leading international developers and suppliers of software for the Sorcerer Computer. SYSTEM SOFTWARE is committed to continuing research and development of new and better products for Sorcerer users. Suggestions for new products or enhancements to the BASIC COMPILER are always welcome. The BASIC COMPILER is a reliable, solid product and SYSTEM SOFTWARE is committed to its continuing excellence.

FEATURES
- Complete easy to read documentation.
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- Extremely compact code and data structure.
- Full boundary and overflow checking.
- Easy to use.
- Fast program development
- Byte, integer and floating point variables.
- 3 to 50 times faster than ROM PAC BASIC.
- The worlds least expensive compiler.
- Disks are not required.
- Simplified programming techniques.
- String cassette Input/Output.
- Special Sorcerer high resolution graphics commands.
- Compatible with the ROM PAC.
- Advanced string handeling techniques used.

SPEED
The BASIC COMPILER is designed for fast compilation and execution of small or large programs with hundreds of lines and variables.
Programs will typically execute 3 to 20 times faster than ROM PAC BASIC. By optimizing the code the user may obtain speed advantages in excess of 50 times, particularly with long programs.

COMPACTNESS
The BASIC COMPILER highly optimizes the generated object code to reduce its size to a minimum. Compared with other compilers, the object code is ½ to ⅓ the size. Together with optional byte and integer constants and variables (Occupying only 1 or 2 bytes of memory each), significant space savings are made and thus allow the compilation and execution of large programs.

RELIABILITY
Unlike some compilers, the BASIC COMPILER checks that all arrays subscripts are within bounds and checks for integer and real overflow. Hence there is no chance of a program producing erroneous and unpredictcable results if a bounds or overflow error occurs.

OPERATIONAL EASE OF USE
The BASIC COMPILER is easy to use. A few simple steps are all that is required to edit, debug, compile, execute and save a program. In addition, all this can be done without having to save anything on cassette or disk. There is no complicated linking and loading process. All BASIC COMPILER options are menu driven for user friendliness.

ENHANCED DATA TYPES
The BASIC COMPILER supports bytes, integers, reals and strings. These data types provide programming flexibility, compact code and maximum execution speed.

ENHANCED CASSETTE INPUT/OUTPUT
The BASIC COMPILER allows **any** type of array to be saved or loaded. Thus byte, integer, real and string arrays may be used in the CLOAD* and CSAVE* statements. The ability to save string arrays opens the opportunity for a whole new range of applications for home, family and business. Text and numeric values (using the new numeric to string conversion BASIC function) can be stored in string arrays, saved and reloaded. Thus, files containing names and addresses together with numeric values can be created, saved, re-read, updated and resaved with maximum efficiency.

GRAPHIC ENHANCEMENT
The BASIC COMPILER includes extra graphics statements (PRINT &, SET and RESET). These facilities, combined with the very fast processing of integers, means that graphics application programs (plots, games, etc.) may be more easily programmed and give much faster screen animation. A 1/6 of a character size dot may be turned on or off anywhere on the screen.

COMPATABILITY
The BASIC COMPILER language is a super set of ROM PAC BASIC with many useful enhancements and few restrictions (which should not seriously inconvenience any user). Any ROM PAC BASIC program should be able to be processed by the BASIC COMPILER. Because integer and byte variables are specified with REM/BYTE and REM/INTEGER statements, which are ignored by ROM PAC BASIC, these programs may be RUN with either ROM PAC BASIC or the BASIC COMPILER.

ADVANCED STRING HANDLING
The BASIC COMPILER has advanced string handling capabilities. The unique method of dynamic string allocation provides full flexibility and also enables string compaction to be avoided completely. Additional string statements and functions (left hand MID$, SPC$, CVI, MKI$ etc) simplify programming and increase execution speed.

PROGRAMMING EASE
Additional features of the BASIC COMPILER may be used to simplify programming. These features include the IF — THEN — ELSE statement, graphics commands, cursor control and additional string functions and others.

PRICE
The BASIC COMPILER is a full compiler with advanced extensions to ROM PAC BASIC and was specifically designed for a wide range of Sorcerer Users. The documentation sets new standards for BASIC language documentation in terms of completeness, logical arrangement and ease of understanding.
The BASIC COMPILER is priced to sell to as wide a market as possible. It is a fraction the cost of any other compiler on the world market today. Considering the development time (in excess of 4000 man hours) and hardware costs we believe that the BASIC COMPILER is unbeatable 'value for money'.

HARDWARE REQUIREMENTS
The BASIC COMPILER has been designed to run on an Exidy Sorcerer computer with at least 32K of RAM.

BASIC COMPILER LANGUAGE
Constants:
Byte, Integer, Real, String.
Scalar Variables:
Integer, Real, String.
Arrays:
Byte, Integer, Real, String.
Operators:
Arithmetic -, +, *,\, /, =
String Concatenation +
Relational =, <, >,<>,<=, >=
Logical NOT, AND, OR, XOR

Specification Statements

REM/OPTION		DIM	REM/BYTE
REM/INTEGER		CLEAR	REM

Assignment Statements

LET		MID$	

Flow Control Statements

END	ON	THEN	STOP
GOSUB	FOR	RETURN	ELSE
IF	GOTO	NEXT	STEP

Input/Output Statements

INPUT	WAIT	RESET	PRINT&
RESTORE	READ	POKE	CLOAD*
SET	PRINT	DATE	OUT
CSAVE*			

User Routines

DEF		FN	USR

Numeric Functions

ABS		EXP	INT
LOG		SGN	SQR

Trigonometric Functions

ATN	TAN	COS	SIN

String Functions

ASC	CHR$	CVI	CVS
INSTR	LEFT$	LEN	MID$
MKI$	MKS$	RIGHT$	
SPC		STR$	VAL

Input/Output Functions

POS		SPC	TAB
PEEK		INP	INKEY

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1 KENT STREET, BICTON, W.A., 6157, AUSTRALIA.

Listing continued.

```
4300 SCROLL
4305 SCROLL
4310 PRINT TAB 5;L$;" LIST"
4320 SCROLL
4330 FOR I=1 TO N
4340 FOR K=1 TO J
4350  SCROLL
4360 PRINT N$(A(K));I$(I,D(A(K),1) TO D(A(K),2))
4370 NEXT K
4380 SCROLL
4390 NEXT I
4400 GOTO 4900
4600 FAST
4610 LPRINT TAB 5;L$;" LIST"
4620 LPRINT
4630 FOR I=1 TO N
4640 FOR K=1 TO J
4650 LPRINT
4660 LPRINT N$(A(K));I$(I,D(A(K),1) TO D(A(K),2))
4670 NEXT K
4680 LPRINT
4690 NEXT I
4700 SLOW
4900 SCROLL
4910 PRINT "ANOTHER LIST?";
4920 INPUT A$
4930 IF A$(1)="Y" THEN GOTO 4000
4950 RETURN

5000 REM SEARCH FOR RECORD
5010 SCROLL
5020 PRINT "WHICH FIELD TO SEARCH ON:"
5030 FOR I=1 TO N1
5040  SCROLL
5050 PRINT N$(I);" ?";
5060 INPUT A$
5070 IF A$(1)="Y" THEN GOTO 5100
5080 NEXT I
5085 SCROLL
5090 PRINT "SELECTION CANCELLED"
5095 GOTO 5900
5100 SCROLL
5110 PRINT "ENTER THE SEARCH STRING";
5120 INPUT A$
5122 LET A=LEN A$
5125 IF A<1 THEN GOTO 5110
5126 IF A<=(D(I,2)-D(I,1)+1) THEN GOTO 5129
5127 LET A=(D(I,2)-D(I,1)+1)
5128 LET A$=A$(1 TO A)
5129 LET A=A-1+D(I,1)
5130 LET F=0
5140 LET Q=0
5150 FAST
5160 FOR J=1 TO N
5170 IF A$=I$(J,D(I,1) TO A) THEN GOSUB 5500
5180 IF Q=1 THEN GOTO 5200
5190 NEXT J
5200 SLOW
5210 SCROLL
5220 PRINT "SEARCH COMPLETE"
5230 SCROLL
5240 IF F=0 THEN PRINT "RECORD NOT FOUND"
5250 GOTO 5900
5500 SCROLL
5504  SCROLL
5505 PRINT "RECORD NUMBER ";J
5510 FOR K=1 TO N1
5520 SCROLL
5530 PRINT N$(K);I$(J,D(K,1) TO D(K,2))
5540 NEXT K
5550 SCROLL
5560 PRINT "CONTINUE SEARCH?";
5570 INPUT B$
5580 IF B$(1)="N" THEN LET Q=1
5590 LET F=1
```

More

response but "Y" will cause the program to continue on to the next field. Once all record fields have been shown, you have the option of changing another record or returning to the menu.

Deleting a Record

A record can only be deleted if the record number is known, and since it may change, you are given the opportunity to search for the record before deleting it. Once the number is entered, the entire record is shown, and you are asked if this is the record you want to delete. Any reply other than "Y" will cancel the delete function. If the record is deleted, all records following the deleted record are moved to fill in the hole.

After dealing with the current record, you have the option of deleting another record or returning to the menu.

Adding Records

When a record is added, a number is displayed showing the relative record number (from the beginning of the record). This record number will change if the records are sorted or if an earlier record (lower record number) is deleted.

Listing Records

Menu item 4 will produce a list of the records in memory. You have the option to list all the record fields, or select the fields you want to list. If you only want to list some fields, each field label will be shown. You can enter a "Y" to accept that field; any other character will reject it.

After you have selected the fields you want, you will be asked whether you want the list displayed on the TV screen (S) or printed (P). If you select the printer, but don't have one, the program will hang.

After the list is finished, you may either return to the menu or print another list.

Searching for a Record

The search capability is one of this program's best features. You can use any field in a search and find matches for one or more characters in that field. Menu item 5 begins by asking you which field you want to use in the search. It will show you the field labels one by one until you enter "Y" to select a field.

Once you have selected the search field, you are asked what you are searching for (the search string). Suppose you want the telephone number

Listing continued.

```
5600 RETURN
5900  SCROLL
5910 PRINT "ANOTHER SEARCH?";
5920 INPUT A$
5930 IF A$(1)="Y" THEN GOTO 5000
5950 RETURN

6000 REM BUBBLE SORT RECORDS
6010 SCROLL
6020 PRINT "SORTING TIME DEPENDS ON "
6021 SCROLL
6025 PRINT "NUMBER OF RECORDS"
6030 SCROLL
6040 PRINT "WHICH FIELD TO SORT BY:"
6050 SCROLL
6060 FOR I=1 TO N1
6070 SCROLL
6080 PRINT N$(I);" ?";
6090 INPUT A$
6100 IF A$(1)="Y" THEN GOTO 6150
6110 NEXT I
6120 SCROLL
6130 PRINT "SORT CANCELLED"
6140 GOTO 6900
6150 SCROLL
6160 FAST
6170 FOR J=1 TO N-1
6180 FOR K=J TO N
6190 IF I$(J,D(I,1) TO D(I,2)) <= I$(K,D(I,1) TO D(I,2))
THEN GOTO 6250
6200 LET B$=I$(J)
6210 LET I$(J)=I$(K)
6220 LET I$(K)=B$
6250 NEXT K
6260 NEXT J
6270 SLOW
6280 SCROLL
6290 PRINT "SORT COMPLETE"
6900 SCROLL
6910 PRINT"SORT ON ANOTHER FIELD?";
6920 INPUT A$
6925 SCROLL
6930 IF A$(1)="Y" THEN GOTO 6000
6950 RETURN

7000 REM SAVE PROGRAM AND DATA TO TAPE
7010 SCROLL
7020 PRINT "PUT CASSETTE IN TAPE RECORDER"
7030 SCROLL
7040 PRINT "BEGIN RECORDING, THEN"
7042 SCROLL
7045 PRINT "PRESS ANY KEY TO SAVE LIST";
7050 IF INKEY$ ="" THEN GOTO 7050
7060 SCROLL
7070 SAVE L$
7900 GOTO 100

8000 REM SET UP NEW LIST
8010 SCROLL
8020 PRINT "WHAT LIST NAME TO USE?";
8030 INPUT L$
8040 SCROLL
8050 PRINT "HOW MANY RECORD FIELDS?";
8060 INPUT N1
8061 PRINT N1
8070 SCROLL
8080 LET K=15
8090 PRINT "MAXIMUM NUMBER OF CHARACTERS IN"
8100 SCROLL
8110 PRINT "DESCRIPTION IS (0-15)?";
8120 INPUT K
8130 IF K>15 THEN LET K=15
8135 IF K< 0 THEN LET K=0
8140 SCROLL
8150 LET L=31-K
```

More

of an acquaintance, but can't remember whether her name is Barbara, Betty or Bo—all you remember is that her name began with a B.

If you select the field containing first names as the search field, then enter "B" as the search string, the program will search the records until it finds a first name that begins with "B." It will show the record number and the entire record, then ask if you want to continue searching. An "N" response will terminate the search; any other reply will cause a search for another match.

In general, you may use n (any number of) characters in the search string, and the program will try to match those n characters to the first n characters of the selected field in each record. If nothing can be matched, you will receive a "Record not found" message.

When the search is finished, you may return to the menu or do another search.

Sorting Records

The sort routine is quite simple and allows for sorting in ascending order only (i.e., in order from A to Z). Beginning with the first field, the program shows you a field label and asks if this is the field you want to sort on.

A "Y" reply will begin the sorting process. Any other reply will result in that question being asked for the next field in the record. After the records are sorted, you may start another sort or return to the menu.

Saving the Program and Records

The ZX-81 has a peculiar method for saving programs and data. When a program is stored on tape, the values of all program variables are stored as well. Thus, to store the records, you must store the program.

When loaded from tape, the program will continue execution from the point where it stopped during the save routine, as long as the save command was executed from within a program. For that reason the Lists program does not stop after being saved, but branches back to the beginning of the program. When the program is saved, it will be saved under the name you selected when setting up the records. Using our example, the program would be saved as Address.

Listing Field Labels

If you forget what fields you have in your record, there are a number of ways to find out.

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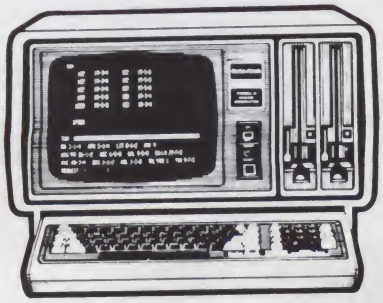

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Listing continued.

```
8160 PRINT "MAXIMUM SIZE OF DATA FIELD"
8170 SCROLL
8180 PRINT "IS ";L;" CHARACTERS"
8182 DIM N$(N1,K)
8184 DIM A(N1)
8186 DIM D(N1,2)
8190 SCROLL
8195 SCROLL
8200 PRINT "NOW ENTER THE FIELD DESCRIPTIONS"
8210 SCROLL
8220 PRINT "AND FIELD LENGTHS:";
8225 LET J=1
8230 SCROLL
8240 FOR I=1 TO N1
8250 SCROLL
8255 LET A$=""
8260 PRINT "FIELD ";I;":";
8270 INPUT A$
8272 PRINT A$
8275 LET A$=A$+"                              "
8280 LET N$(I)=A$
8290 SCROLL
8300 PRINT "FIELD LENGTH (1-";L;"):";
8310 INPUT A
8312 IF A<1 THEN LET A=1
8315 IF A>L THEN LET A=L
8317 PRINT A
8320 LET D(I,1)=J
8330 LET J=J+A
8335 LET D(I,2)=J-1
8340 SCROLL
8350 NEXT I
8360 LET J=J-1
8370 LET N=0
```

More

to use menu item 9, but the fields are also available in a sort, a list and a search.

If the program doesn't work after you've entered it, carefully check each Basic keyword that you entered. You may have keyed in the letters for a keyword instead of pressing the proper key on the keyboard. I had a nasty habit of typing "T" and "O" for "TO" instead of using the "To" key.

I have included a list of the major variables used in the program to facilitate user modifications (Table 2). Several enhancements could be added to the program, but I was concerned with the program size.

You will discover that the program runs rather slowly. This is because the ZX-81 runs slowly.

One evening I compared the speed of the ZX-81 to that of my Apple computer. I started the ZX-81 chugging away on a graphics pattern program (a program listing that was included with the ZX-81 computer). While the ZX-81 was drawing the picture, I entered the program on my Apple, converted it to use Apple's hi-res graphics, ran the graphics pattern that the ZX-81 was still working on, then

Listing continued.

```
8380 LET M=INT ((8000-N1*(31-L+12))/J)
8390 SCROLL
8400 PRINT "MAXIMUM NUMBER OF RECORDS"
8410  SCROLL
8420 PRINT "POSSIBLE IS ABOUT ";M
8430  SCROLL
8435 PRINT "HOW MANY RECORDS DO YOU WANT?";
8437 INPUT A
8439 LET A=INT A
8440 IF A>0 AND A<M THEN LET M=A
8450 DIM I$(M,J)
8900 SCROLL
8910 PRINT L$;" LIST SET UP"
8920 SCROLL
8930 PRINT "PRESS ANY KEY TO RETURN TO MENU"
8940 IF INKEY$ ="" THEN GOTO 8940
8950 RETURN

9000 REM LIST FIELDS
9020 SCROLL
9030 PRINT TAB 5;L$;" LIST FIELDS"
9040 SCROLL
9050 FOR I=1 TO N1
9060  SCROLL
9065  SCROLL
9070 PRINT N$(I)
9080 NEXT I
9090  SCROLL
9100 PRINT "PRESS ANY KEY TO RETURN TO MENU";
9105 SCROLL
9110 IF INKEY$ ="" THEN GOTO 9110
9900 RETURN
```

changed the pattern four more times, running the program each time.

In all this time, the ZX-81 hadn't finished the first pattern. The Apple is considerably faster than the ZX-81, but the Apple is considerably more expensive!■

Simple variables:

A,A$	—answers to prompts
B$	—utility string
I,J,K	—utility indexes
N	—contains the number of records in array 1
N1	—contains the number of fields defined for the record
M	—the maximum number of records allowed in the array

Array variables:

A	—keeps track of the fields to be printed in Menu item 4
D	—two dimensional array containing the start and stop positions for each field in the record
I$	—contains the actual records; each record is one entry in the array
N$	—contains the descriptions or labels for each field

Table 2. List of major variables used in the file manager program.

Break the 1K Barrier

Double the program memory in your Sinclair ZX-81 for less than $10.

By Thomas Mears

Although I think my new Sinclair ZX-81 is the best buy around, it took only two days of programming before I started exceeding the skimpy 1K bytes of program memory available.

True, a 16K memory expansion module is available for $50, but this adds substantially to the cost of the computer, thereby defeating my main reason for choosing the ZX-81 over other models. Clearly, a less drastic, less expensive memory upgrade was required.

Fortunately, there's another route to take. Although the Sinclair literature doesn't mention it, the ZX-81 designers have obligingly designed the printed circuit board to accommodate JEDEC-compatible RAMs, such as the Hitachi HM6116. This high-speed, low-power 2K×8 RAM is currently available from several *Microcomputing* advertisers for about $6.

Replacement of the current ZX-81 RAM with an HM6116 will double the size of the computer's memory, and it takes just a few minutes to install.

To make the modification, first remove the circuit board from the case and disconnect the keyboard ribbon cables. Then, remove all the integrated circuits from their sockets, taking care to observe proper handling procedures for static-sensitive devices. You should be warned, however, that if you own a factory-assembled ZX-81, you will void the 90-day manufacturer's warranty by opening the case.

Sinclair ships the ZX-81 with one of two memory types. Your unit should contain either a single 24-pin MK4118 (IC4) or two 20-pin 2114s (IC4a and IC4b) (see Fig. 1).

If your computer uses the MK4118, little additional modification is required. Simply disconnect jumper L1

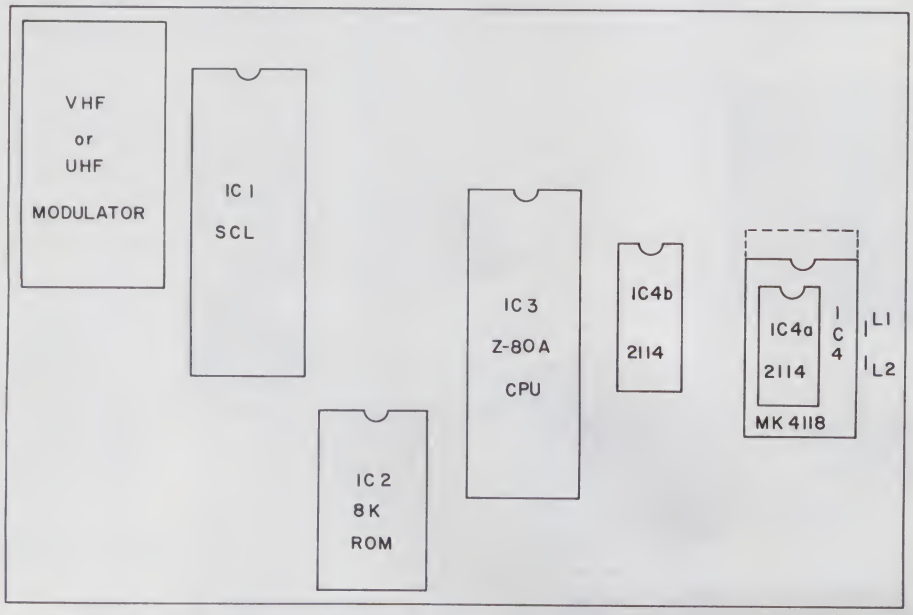

Fig. 1. Top view of ZX-81 circuit board, showing location of memory chips. IC4 is mounted to the lower 24 pins of the 28-pin circuit pattern (dotted line). IC4a and IC4b may be present instead of IC4.

Address correspondence to Thomas E. Mears, PO Box 5399, Fort Worth, TX 76108.

(next to pin 19 of IC4) and solder a new jumper across L2. This connects pin 19 to address A10 of the Z-80 microprocessor (pin 40 of IC3). Then, plug the HM6116 into the IC4 socket.

If your ZX-81 uses two 2114s, you will find that one of the 20-pin sockets (IC4a) is soldered over the circuit layout for IC4. Carefully remove this socket, checking that no solder splashes or flakes are left, and install a low-profile, 24-pin DIP socket in the space provided for IC4 (use the lower 24 pins of the 28-pin pattern as shown in Fig. 1). Then, solder a jumper across L2 and plug in the HM6116. The remaining 20-pin socket (IC4b) should not be used.

> Replacement of the current ZX-81 RAM... will double the size of the computer's memory, and takes just a few minutes to install.

When the modification is completed, reassemble the computer and run several exercises from the owner's manual to verify proper operation. You will find that if you perform the exercises described in Chapter 23 ("When the Computer Gets Full"), the ZX-81 will no longer exhibit the annoying jumps and other strange occurrences associated with a lack of memory space. You actually will have more than doubled the available program space, since part of the original 1K bytes of memory is used to store system variables.

You may choose to use a 28-pin DIP socket instead of the 24-pin, so you can expand further when JEDEC-standard 4K, 8K or even 16K byte RAMs become available. However, the upgrade here isn't quite as clean, requiring cuts to existing circuit traces and jumpers to make the conversion.

Even with 2K bytes of RAM, I still run out of program space occasionally, but much less often than before I broke the 1K barrier.

Eventually, I'll probably upgrade to the 16K expansion module, but in the meantime, I'm enjoying the benefits of expanded memory at a fraction of the cost. ■

Holy Macro!

For all you lazy Basic programmers out there, this Apple-Macro II program lets you enter Basic commands with only two keystrokes, thus making you a faster programmer and saving wear and tear on your fingers.

By Robert L. Hurt

Many, many versions ago, when I first received my Apple II, I remember jealously observing some TRS-80 software that would allow entry of basic commands in two easy keystrokes. That, thought I, would be paradise. Nevermore would I have to type FOR I = 1 TO. . . .

I patiently waited for some programming genius to offer a version of this for the Apple. No one ever did. So after slaving over countless basic statements, I eventually learned some of the tricks of machine-language programming. Being the lazy slouch that I am, I decided to write that program for myself.

Program Description

Apple-Macro II is configured for a 48K Apple II with one or more disk drives. For other memory sizes or for users without a disk operating system, see "Adaptation Notes" in the last section of this article.

Basic commands are entered with two keystrokes. First, the escape key is pressed, followed by the alphanumeric character that corresponds to the appropriate command (see Table 1).

The program is compatible with either Applesoft or Integer Basic, although many commands unique to Applesoft are included. No command of three or fewer letters was used as a macro since little would be gained by reducing it to two keystrokes.

There are several special DOS commands available that should be explained. ESC-1 issues a Catalog complete with a carriage return. ESC-4 is the equivalent of the Applesoft statement D$ = CHR$(4), but also works with Integer Basic. ESC-5 is handy for entering DOS commands from within a program, as long as D$ already has been defined as control-D.

Other non-DOS special functions include ESC-F, which enters what is probably the most commonly-used basic statement: "FOR I = 1 TO". ESC-Z prints the Apple II logo, complete with brackets.

Screen editing abilities are also included in the routine. Since the character keys are used for other purposes, the cursor movement commands must be entered differently. For users with an Autostart ROM, the ESC-I, -J, -K and -M cursor movement commands are replaced with ESC control-I, -J, -K and -M.

Users with the regular monitor ROM will find the ESC-A, -B, -C and -D commands also changed to control characters. In both cases, once the escape mode is entered, all input characters are checked until either an invalid character or a keyboard macro character is entered. This means that in both modes of cursor movement, the escape key need be hit only once; all further control codes will move the cursor.

The user should be careful not to type a character after repositioning the cursor; this will cause a macro command to be printed, possibly overwriting the text to be copied. It is often convenient to use the space bar to exit the ESC mode to avoid this type of mistake.

Program Notes

Now for a little more information about how this program works. Using the character input vector (which contains the address of the program to read a character from the keyboard), the initialization stage of the program (lines 20–24) routes all keyboard input from the standard routine in ROM to this program. The operation of the standard monitor input routine is mimicked until the escape key is pressed. Then the special keyboard macro and cursor movement routines are executed.

After the escape key is pressed, the program gets another character from the user (lines 47 and 49–52). It then checks for control characters corresponding to cursor movement and calls the appropriate monitor routines when they are found (lines 53–54 and 63–76). It then branches back to get the next escape code.

If the input character is not a cursor movement code, it is checked for the valid keyboard macro range (lines 55–58). If it is invalid, the escape mode is cancelled and the next character is read from the keyboard (lines 59–61). Otherwise, the input character is turned into an index value and the appropriate command string is found (lines 77–86). The accumulator is loaded with the first letter and this subroutine is exited (lines 87–93).

On the next pass through the program, the word pointer is found to be nonzero (lines 42–43), so the routine branches again to the data read portion, incrementing the pointer to the next letter (lines 87–93). Once the end-of-word delimiter ("@") is reached,

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the pointer is returned to 0 and the next character is read (lines 94–99).

It is not difficult to customize this program to individual needs. Different commands can be substituted for those I've included. The only limitations are that a single "@" must separate every command and that the entire data listing cannot exceed 256 characters (mine is exactly 256 characters!).

Adaptation Notes

Apple-Macro is located at address $6000 hex, which is just above the section of memory devoted to hi-res graphics. On DOS systems of less than 48K and non-DOS systems of less than 32K, it will be necessary to relocate the program to another point in memory. On these smaller systems, it is best to move the program to just under the highest available address and to adjust HIMEM: appropriately (see Table 2).

To adjust the program, the value $6000 in line 19 of the program listing should be replaced with the new starting address from Table 2. Then, the value $60 in line 22 should be changed to the first two digits of this new address.

Non-DOS systems will also require an additional modification to the initialization phase. The JMP DOS statement in line 24 should be replaced by RTS, followed by two NOPs. The

Program listing. Apple-Macro II program allows for easy entry of basic commands.

```
SOURCE FILE: APMAC
                      1 ;*************************************************
0000:                 2 ;*
0000:                 3 ;*                APPLE-MACRO II
0000:                 4 ;*
0000:                 5 ;*             WRITTEN BY ROBERT L. HURT
0000:                 6 ;*
0000:                 7 ;*
                      8 ;*************************************************
C000:                 9 KBD      EQU  $C000
C010:                10 KBDSTRB  EQU  $C010
0028:                11 BASL     EQU  $28
004E:                12 RNDL     EQU  $4E
004F:                13 RNDH     EQU  $4F
03EA:                14 DOS      EQU  $03EA
0038:                15 IN       EQU  $38
0024:                16 CH       EQU  $24
FB9B:                17 ESCNOW   EQU  $FB9B
FC2C:                18 ESC1     EQU  $FC2C
----- NEXT OBJECT FILE NAME IS APMAC.OBJ0
6000:                19          ORG  $6000
6000:A9 26           20          LDA  #$26       ;SET KEYIN POINTER
6002:85 38           21          STA  IN
6004:A9 60           22          LDA  #$60
6006:85 39           23          STA  IN+1
6008:4C EA 03        24          JMP  DOS
600B:A4 24           25 CURSOR   LDY  CH         ;PLACE FLASHING CURSOR
600D:B1 28           26          LDA  (BASL),Y
600F:48              27          PHA
6010:29 3F           28          AND  #$3F
6012:09 40           29          ORA  #$40
6014:91 28           30          STA  (BASL),Y
6016:68              31          PLA
6017:60              32          RTS
6018:E6 4E           33 KEYRD    INC  RNDL
601A:D0 02           34          BNE  KEYRD2
601C:E6 4F           35          INC  RNDH
```

More →

,	CHR$(
–	n/u
.	STR$(
/	n/u
0	LIST
1	CATALOG<CR>
2	LOAD
3	SAVE
4	D$ = "<CTRL-D>"
5	PRINT D$;"
6	DELETE
7	NORMAL
8	INVERSE
9	FLASH
:	n/u
;	RIGHT$(
<	n/u
=	n/u
>	n/u
?	PRINT
@	n/u
A	ASC$(
B	DEF FN
C	CALL
D	DATA
E	PEEK(
F	FOR I = 1 TO
G	GOTO
H	HOME
I	INPUT
J	HPLOT
K	PLOT
L	LEFT$(
M	MID$(
N	NEXT
O	POKE
P	PDL(
Q	HCOLOR=
R	RETURN
S	GOSUB
T	THEN
U	USR(
V	VTAB
W	COLOR=
X	DRAW
Y	HTAB
Z	APPLE] [

("n/u" indicates that character is not used.)

Table 1. List of commands with their corresponding keys.

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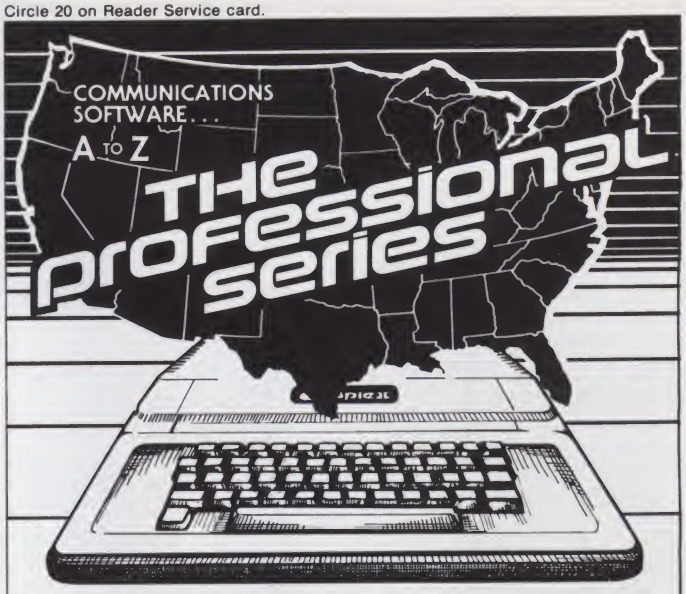

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Listing continued

```
601E:2C 00 C0    36 KEYRD2  BIT  KBD
6021:10 F5       37         BPL  KEYRD
6023:91 28       38         STA  (BASL),Y
6025:60          39         RTS
6026:20 18 60    40 GETCHR  JSR  KEYRD      ;MAIN ENTRY
6029:8E B8 60    41         STX  XSTR       ;PRESERVE X REGISTER
602C:AD B6 60    42         LDA  PNT        ;CHECK FOR WORD IN TRANSIT
602F:D0 63       43         BNE  DATARD     ;IF SO, BRANCH
6031:AD 00 C0    44         LDA  KBD        ;ELSE GET KBD CHARACTER
6034:2C 10 C0    45         BIT  KBDSTRB    ;RESET KDB STRB
6037:C9 9B       46         CMP  #$9B       ;CHECK FOR ESC
6039:F0 01       47         BEQ  CODEIN     ;IF SO, GET MACRO CODE
603B:60          48         RTS             ;ELSE RETURN
603C:A9 A0       49 CODEIN  LDA  #$A0
603E:20 0B 60    50         JSR  CURSOR
6041:20 18 60    51         JSR  KEYRD
6044:AD 00 C0    52         LDA  KBD
6047:C9 8E       53         CMP  #$8E       ;CHECK CHAR >= CTRL-N
6049:90 11       54         BCC  CURMOV1
604B:C9 AC       55         CMP  #$AC       ;CHECK FOR VALID MACRO RANGE,
604D:90 04       56         BCC  INVAL      ; "," ... "Z"
604F:C9 DB       57         CMP  #$DB
6051:90 2A       58         BCC  MACRO      ;IF VALID, GET KBD MACRO
6053:2C 10 C0    59 INVAL   BIT  KBDSTRB    ;IF NOT VALID, GET NEXT CHAR
6056:20 0B 60    60         JSR  CURSOR     ;PLACE CURSOR
6059:4C 26 60    61         JMP  GETCHR
605C:C9 85       62 CURMOV1 CMP  #$85       ;CHECK FOR MONITOR ROM CURSOR MOVE
605E:B0 0C       63         BCS  CURMOV2
6060:2C 10 C0    64         BIT  KBDSTRB
6063:69 40       65         ADC  #$40
6065:38          66         SEC
6066:20 2C FC    67         JSR  ESC1
6069:4C 3C 60    68         JMP  CODEIN
606C:C9 89       69 CURMOV2 CMP  #$89       ;CHECK FOR CURSOR MOVE
606E:90 E3       70         BCC  INVAL
6070:C9 8C       71         CMP  #$8C
6072:F0 DF       72         BEQ  INVAL
6074:18          73         CLC
6075:69 40       74         ADC  #$40       ;CHANGE CTRL-CHARS TO CHARS
6077:20 9B FB    75         JSR  ESCNOW     ;USE AUTOSTART ROM SUBROUTINE
607A:4C 3C 60    76         JMP  CODEIN     ;GET NEXT ESC CHARACTER
607D:E9 AA       77 MACRO   SBC  #$AA
607F:8D B7 60    78         STA  CNT
6082:A2 FF       79         LDX  #$FF       ;INITIALIZE CHARACTER POINTER
6084:A9 C0       80         LDA  #$C0       ;LOAD ACC WITH '@' CODE
```

More →

No-Operations are added to maintain the same addresses for the succeeding lines.

Conclusion

I have already found this program to be a great help when I write basic programs, but it does take some getting used to. I would recommend that you keep a listing of the command macros by the computer as you program, using only the macro codes to enter commands even when you make mistakes. Once the more commonly-used macros become familiar, you should be able to program faster and have fewer spelling errors.■

Adapting to Other Memory Sizes

	Memory size	Start program
With DOS	32k	$5400 (21503)
	16k	$1400 (5119)
Without DOS	32k	$7E00 (32254)
	16k	$3E00 (15872)

(Numbers in parentheses indicate values for HIMEM:.)

Table 2. List of memory locations.

Listing continued

```
6086:E8          81 WORDFND INX              ;INCREMENT INDEX POINTER
6087:DD B9 60    82         CMP  DATA,X      ;CHECK FOR '@'IN DATA
608A:D0 FA       83         BNE  WORDFND
608C:CE B7 60    84         DEC  CNT         ;IS POINTER AT RIGHT WORD?
608F:D0 F5       85         BNE  WORDFND     ;IF CNT NOT 0, TRY NEXT WORD
6091:8E B6 60    86         STX  PNT         ;STORE X IN POINTER
6094:AE B6 60    87 DATARD  LDX  PNT         ;LOAD POINTER VALUE TO X REG
6097:E8          88         INX              ;INCREMENT TO NEXT LETTER
6098:BD B9 60    89         LDA  DATA,X      ;GET LETTER AT POINTER
609B:8E B6 60    90         STX  PNT         ;STORE POINTER VALUE
609E:AE B8 60    91         LDX  XSTR        ;RESTORE X REGISTER
60A1:C9 C0       92         CMP  #$C0        ;CHECK FOR END OF WORD
60A3:D0 10       93         BNE  NEXTLTR     ;BRANCH IF NOT
60A5:A9 00       94         LDA  #$00        ;ELSE
60A7:8D B6 60    95         STA  PNT         ;RESET PNT TO 0
60AA:A9 A0       96         LDA  #$A0        ;LOAD SPACE
60AC:2C 10 C0    97         BIT  KBDSTRB     ;RESET KBD STRB
60AF:20 0B 60    98         JSR  CURSOR
60B2:4C 26 60    99         JMP  GETCHR      ;AND GET ANOTHER CHARACTER
60B5:60         100 NEXTLTR RTS              ;RETURN WITH NEXT LETTER
60B6:00         101 PNT     DFB  $00
60B7:00         102 CNT     DFB  $00
60B8:00         103 XSTR    DFB  $00
60B9:C0 C3 C8   104 DATA    ASC  '@CHR$('
60BC:D2 A4 A8
60BF:C0 C0 D3   105         ASC  '@@STR$('
60C2:D4 D2 A4
60C5:A8
60C6:C0 C0 CC   106         ASC  '@@LIST'
60C9:C9 D3 D4
60CC:C0 C3 C1   107         ASC  '@CATALOG'
60CF:D4 C1 CC
60D2:CF C7
60D4:8D         108         DFB  $8D         ;CARRIAGE RETURN
60D5:C0 CC CF   109         ASC  '@LOAD'
60D8:C1 C4
60DA:C0 D3 C1   110         ASC  '@SAVE'
60DD:D6 C5
60DF:C0 C4 A4   111         ASC  '@D$="'
60E2:BD A2
60E4:84 A2      112         DFB  $84,$A2     ;CTRL-D AND QUOTATION
60E6:C0 D0 D2   113         ASC  '@PRINTD$;"'
60E9:C9 CE D4
60EC:C4 A4 BB
60EF:A2
60F0:C0 C4 C5   114         ASC  '@DELETE'
60F3:CC C5 D4
60F6:C5
60F7:C0 CE CF   115         ASC  '@NORMAL'
60FA:D2 CD C1
60FD:CC
60FE:C0 C9 CE   116         ASC  '@INVERSE'
6101:D6 C5 D2
6104:D3 C5
6106:C0 C6 CC   117         ASC  '@FLASH'
6109:C1 D3 C8
610C:C0 C0 D2   118         ASC  '@@RIGHT$('
610F:C9 C7 C8
6112:D4 A4 A8
6115:C0 C0 C0   119         ASC  '@@@'
6118:C0 D0 D2   120         ASC  '@PRINT'
611B:C9 CE D4
611E:C0 C0 C1   121         ASC  '@@ASC('
6121:D3 C3 A8
6124:C0 C4 C5   122         ASC  '@DEFFN'
6127:C6 C6 CE
612A:C0 C3 C1   123         ASC  '@CALL'
612D:CC CC
612F:C0 C4 C1   124         ASC  '@DATA'
6132:D4 C1
6134:C0 D0 C5   125         ASC  '@PEEK('
6137:C5 CB A8
613A:C0 C6 CF   126         ASC  '@FOR I=1 TO'
613D:D2 C9 BD
6140:B1 D4 CF
6143:C0 C7 CF   127         ASC  '@GOTO'
6146:D4 CF
6148:C0 C8 CF   128         ASC  '@HOME'
614B:CD C5
614D:C0 C9 CE   129         ASC  '@INPUT'
6150:D0 D5 D4
6153:C0 C8 D0   130         ASC  '@HPLOT'
6156:CC CF D4
6159:C0 D0 CC   131         ASC  '@PLOT'
615C:CF D4
615E:C0 CC C5   132         ASC  '@LEFT$('
6161:C6 D4 A4
6164:A8
6165:C0 CD C9   133         ASC  '@MID$('
6168:C4 A4 A8
616B:C0 CE C5   134         ASC  '@NEXT'
616E:D8 D4
6170:C0 D0 CF   135         ASC  '@POKE'
6173:CB C5
6175:C0 D0 C4   136         ASC  '@PDL('
6178:CC A8
617A:C0 C8 C3   137         ASC  '@HCOLOR='
617D:CF CC CF
6180:D2 BD
6182:C0 D2 C5   138         ASC  '@RETURN'
6185:D4 D5 D2
6188:CE
6189:C0 C7 CF   139         ASC  '@GOSUB'
618C:D3 D5 C2
618F:C0 D4 C8   140         ASC  '@THEN'
6192:C5 CE
6194:C0 D5 D3   141         ASC  '@USR('
6197:D2 A8
6199:C0 D6 D4   142         ASC  '@VTAB'
619C:C1 C2
619E:C0 C3 CF   143         ASC  '@COLOR='
61A1:CC CF D2
61A4:BD
61A5:C0 C4 D2   144         ASC  '@DRAW'
61A8:C1 D7
61AA:C0 C8 D4   145         ASC  '@HTAB'
61AD:C1 C2
61AF:C0 C1 D0   146         ASC  '@APPLE'
61B2:D0 CC C5
61B5:A0 DD DB   147         DFB  $A0,$DD,$DB
61B8:C0         148         ASC  '@'

*** SUCCESSFUL ASSEMBLY: NO ERRORS
```

Inside Apple®

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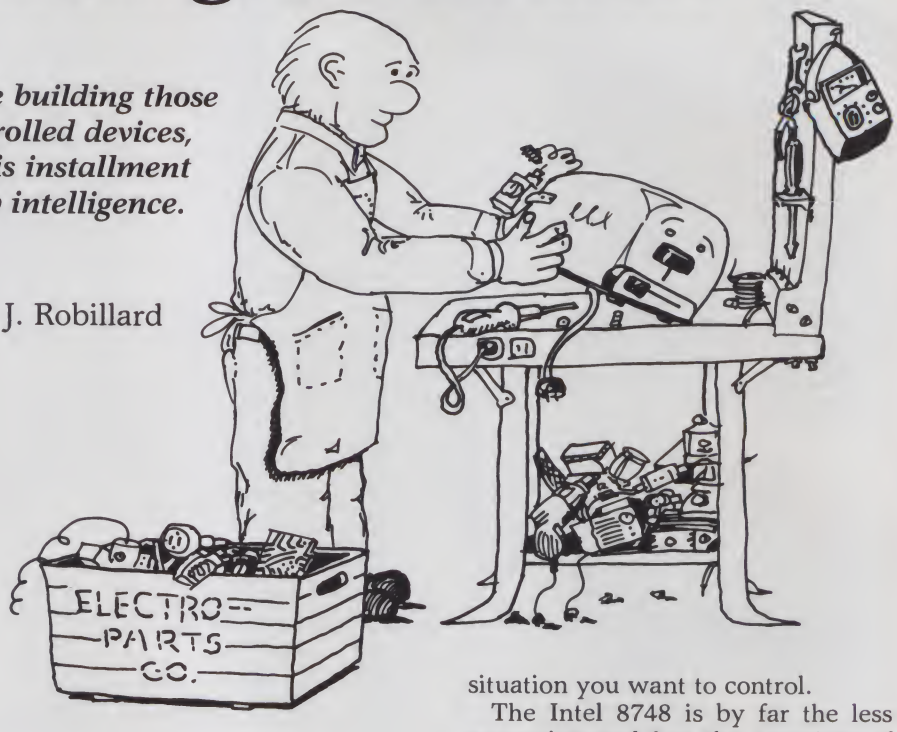
The Intelligent Toaster

Before you tackle building those computer-controlled devices, you'll need to understand this installment on single-chip intelligence.

By Mark J. Robillard



The intelligent machines of today package an enormous amount of thinking power into relatively small areas. The reduction of micros to their current size was necessary because the demand for portable instruments increased. The portability of intelligence is a direct result of the single-chip microcomputer.

This article, along with the April and May continuations, will attempt to introduce you to new components in the hope that you will begin to use them in your experimentation. Some of the projects coming up in this series will use these devices, so familiarization now is necessary. Although complete user's manuals are available on all the products I'll cover, I hope you will find this series sufficient to guide you through the learning process.

Microcomputing

That word ought to be familiar to you; I'm sure you've plunked down money to buy a magazine of the same title.

As you may or may not know, there is a difference between microprocessing and microcomputing. A microcomputer contains a complete complement of program and data memory as well as input and output facilities.

The microcomputers we will study here are contained in single 40-pin IC packages. Yes, they do contain both types of memory, some I/O and, in most cases, a general-purpose timer for event-counting, pulse width determination or delay-loop timing. All of the micros we'll consider operate from a single five-volt supply running approximately a hundred milliamps. These compact, low-power characteristics allow us to construct the versatile controllers that run as a part of the UNIMEM home control system.

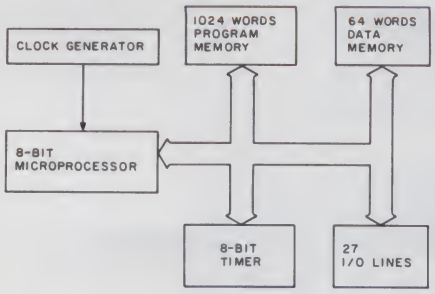


Fig. 1. Block diagram of the Intel 8748.

Operation Particulars

This time we'll investigate two of the available single-chip micros. The Intel 8748 and the Motorola 68701 are available through mail-order houses at reasonable costs. Each has its advantages, depending on the situation you want to control.

The Intel 8748 is by far the less expensive and has the notoriety of being the first part to incorporate a system. The Motorola part is more expensive but, as you will see, has the most capability. Instead of covering each separately, let's look at individual functions and identify their operations as they pertain to each part.

Internal Architecture

The functional insides of the 8748 are depicted in Fig. 1, which is a rather simple representation of the actual insides.

First, note the 1K×8 of program memory. This is read only and it contains the control program for the micro. In the case of the 8748, this memory is erasable and field-programmable, much like a 2708 EPROM is. Instructions are fetched internally from this memory; there is no obvious data or address line.

Fig. 2 shows a similarly simplified view of the functional blocks of the Motorola 68701. The erasable program memory contained in this part is twice that of the 8748. Programming a 68701, however, is much

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simpler than the other (as you'll see in next month's article).

Both parts have erasable program memory on-board in small but useful amounts. If you're used to programming a Z-80 and have found that you can't do much in 1K anymore, don't worry; these micros have instruction sets that take advantage of custom routines that allow single-byte op codes in over 70 percent of the set (8748). Those familiar with the 6800 family of processors, or the somewhat less-adept 6500 series, will take heart in knowing that the 68701 is code-compatible with the 6800.

Moving on, let's look at data memory. This is where your first real disappointment will be. The 8748 gives you only 64 bytes of space—hardly enough for a subroutine stack. Motorola was somewhat more generous with 128 bytes.

Why the small amounts of memory locations? Remember, these are I/O controllers, not Apple IIs on a chip. When performing hardware emulation, you will find that in many instances you won't need even a third of the 64K available in the Intel part.

So, as far as memory goes, both parts are alike. Sure, the Motorola part has twice the storage, but there is a comparable Intel part called the 8749 that matches it.

Memory is the only function these two parts have in common. I/O is where the 68701 shines. By looking at the block diagram (Fig. 2), you can see that, along with 28 general-purpose pins for use as inputs or outputs, there is a full-function UART included. This can come in handy in situations where you want to communicate serially to a host computer.

The 8748 incorporates no internal UART. It does, however, have 27 input and output lines that are easily programmed. One should not criticize Intel for not keeping up with Motorola in functionality, because, you see, there is a part that Intel makes (8751) that far surpasses the competition. It's not considered here because it's not widely available through hobbyist outlets.

Timers are useful machines; they allow us to create a pulse or string of pulses with little or no software intervention. We can count pulses that may present themselves to the controller; if the period is slow enough, the counter may be used to measure its frequency. The 8748 has one eight-bit up-counter; it can be used in one of two modes: timer or event counter. The 68701 incorporates a 16-bit up-counter that allows multiple functions and a variety of uses.

Nitty-Gritty, 8748

Well, so much for the generalities. It's time to choose a way to go and specifically learn inner workings. For the command communicator design, which will be presented in the May edition, I've chosen the 8748. Before you ask why, let me explain. You can purchase the Intel part for under $15 (some places sell it for less than $10) and that's not a serious investment. Spend four times that price and you *might* get a 68701.

Let's start back at the top. As I said, the 8748 contains 1024 bytes of erasable program memory. I'll assume you are familiar with EPROMs, so I won't go into the whys and the wherefores of how they work.

I will, however, explain how to program this memory. In fact, before we're through, you'll have the opportunity to actually construct an 8748

programmer-emulator that works with anybody's home computer. Before we can get into it, there are some pins on the part that must be defined.

Fig. 3 shows the pin layout of the 8748. Starting from pin 1, let's define the function of each.

Pin 1: T0—This is an input or output pin. You can test the state of it for either a high or low and branch to another place in the program. When used as an output, an ENT0 CLK instruction will cause a clock signal (that is one-third the crystal frequency) to be generated from this pin. T0 is also used to select program mode when the EA pin (7) is placed at programming voltage level.

Pins 2 and 3: XTAL1,2—These are the crystal connections. An external crystal in the range of one MHz and six MHz may be connected across these two pins. Extra capacitance must be added to provide reliable operation. Fig. 4 shows typical crystal hookups. An external frequency pulse may be applied to the XTAL1, pin 2, if the circuit shown in the figure is used.

Pin 4: RESET—This input provides an initialization to the microcomputer. Typically it would be connected to a power-on detector that would automatically invoke initialization. Fig. 5

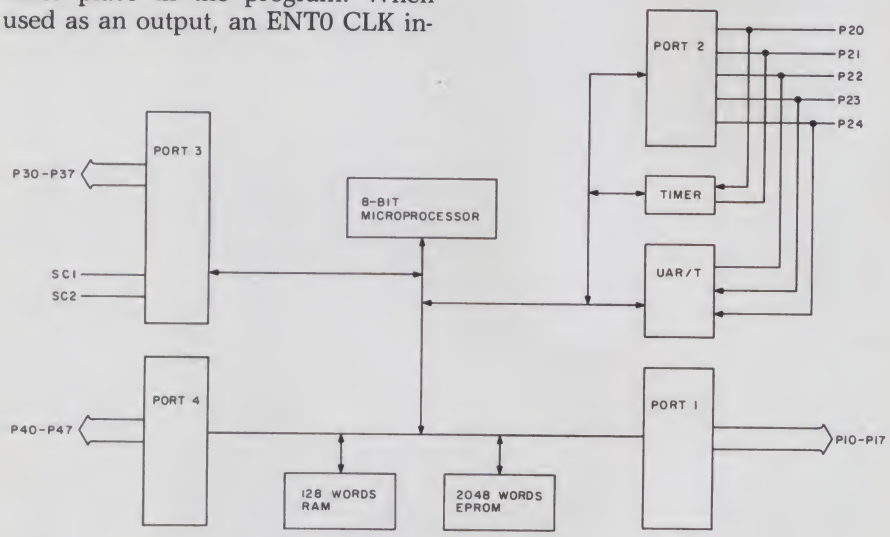

Fig. 2. Block diagram of the Motorola 68701.

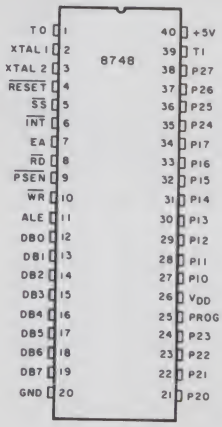

Fig. 3. Pin functions of the 8748.

shows the internal and external particulars of making the reset input functional. When the reset is initiated, the following functions are performed:

1. The program counter is cleared (000).
2. The stack pointer is set to 0.
3. Register bank 0 is selected.
4. Memory bank 0 is selected.
5. The Bus outputs are floated at a high impedance state.
6. Both Port 1 and Port 2 are set to the input mode.
7. Interrupts are all disabled.
8. Timer is stopped.
9. The timer overflow flag is cleared.
10. General-purpose flags F0 and F1 are cleared.
11. T0 becomes an input.

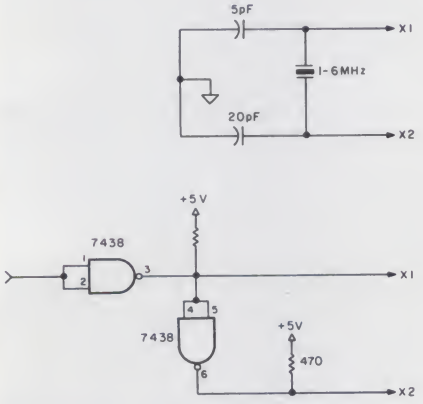

Fig. 4. Details for connection of either a crystal or external frequency source to the XTAL pins.

Pin 5: $\overline{SS}$—No, it's not akin to the Hitler regime. It stands for single-step. Remember that function that all the good front panels used to have? Well, this pin, along with the ALE pin (11) and an external chip or two, will perform an instruction single-step that is extremely useful in debugging. The circuit of Fig. 6 shows the circuitry necessary to implement this function.

Pin 6: $\overline{INT}$—This interrupt input will vector the program to location 003. A low-level pulse will initiate it. (More on this later.)

Pin 7: EA—We've already mentioned this pin in connection with programming (T0). Actually, it's another of those multipurpose pins. Its title is External Access and during normal operation the pin will either be at a logic low or a high. When EA is low, all program memory fetches are taken from internal EPROM. When high, the use of an external ROM or RAM may take the place of the internal EPROM. This is useful in emulation, as you will see later.

Pin 8: $\overline{RD}$—When accessing external memory (data), the RD line is used much like the read line of any microprocessor. During program memory fetches or data memory accesses from internal functions, this pin will be inactive.

Pin 9: $\overline{PSEN}$—When the part is configured to fetch from external program memory (EA = 1), this pin acts as a combination chip enable-read line to that external memory part. The RD line does not respond to external program memory fetches.

Pin 10: $\overline{WR}$—Used in conjunction with the RD line on external data

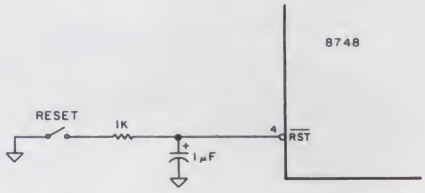

Fig. 5. Circuit to provide power-on reset as well as push-button manual reset to the 8748.

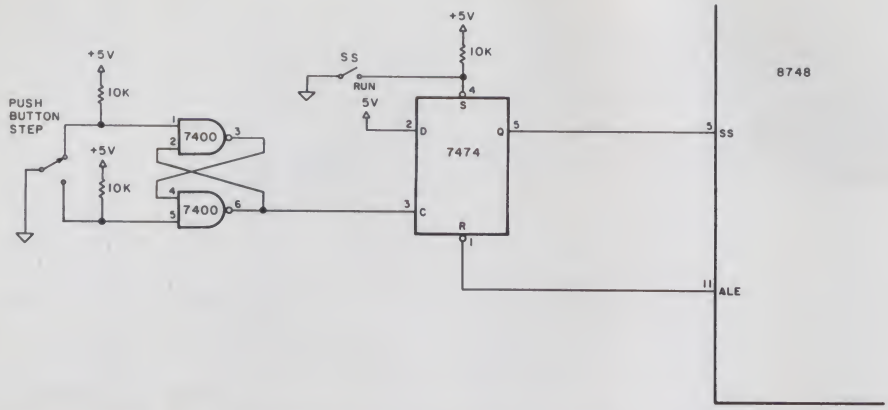

Fig. 6. Simple connection of a debounced switch and single flip flop provide a useful instruction single-step function to the 8748.

accesses, this one provides write-gating.

Pin 11: ALE—If you're familiar with the 8085A, you'll recognize this signal. When external memory is to be accessed, the address latch enable (ALE) signal will latch the lower eight addresses from the bus. This signal occurs once each cycle. (More on external memory later.)

Pins 12–19: BUS—Here are eight bi-directional three-state bus lines that may be used as general purpose I/O. If external memory is used, these lines become a combination of data bus and low-order address bus (see ALE).

Pin 20: GND—What can I say about ground? The buck stops here.

Pins 21–24, and *P20–23*—These are four of the eight Port 2 I/O lines. This port may be read or set; each pin may be an input or an output. The pins function as address lines when you use external memory.

Pin 25: PROG—This is the business pin for programming the erasable program memory. During the process, a 23-volt pulse is applied here for approximately 50 ms; this causes the state of the bus lines to be copied, at that time, into the previously-addressed program memory location. (More on this next month.)

Pin 26: V_{DD}—Programmer power is applied here to the tune of 25 volts. During normal operation, this input should be at +5 volts.

Pins 27–34: Port 1—These are eight lines of general-purpose input or output; they are not used for any other purpose.

Pins 35–38 and *P24–P27:* These are the upper four lines of Port 2. The lower lines are at pins 21–24. I/O expansion is accomplished through these pins and the PROG pin. (More on this next month.)

Pin 39: T1—Remember T0? Well, T1 isn't quite as exciting, but it does have a few functions. Besides its use as a testable input pin, T1 may be internally connected (by software) to the timer input. (Getting counting ideas?)

Pin 40: Vcc—This is where it all begins. Apply +5 volts here.

Believe it or not, there are no other pins.

Before we ventured into this chip pin-out, we were trying to examine the programming of the erasable EPROM. Next month, we'll look at a step-by-step description of the program operation and try to design a circuit that will allow us to accomplish it.■

Commodore Launches A Winner

The C-64 is all that it is cracked up to be. It features exceptional graphics, color and sound; compatibility with VIC peripherals; and 64K— all at a price that's difficult to beat.

By Robert W. Baker

The Commodore-64 looks like a VIC-20 in a light brown case, but there's really a world of difference between the two machines.

Once you start looking closer, you'll notice a number of external changes, but you really have to see it running to appreciate the new world of the Commodore-64. It's not just a 40-column VIC—it's a whole new machine.

C-64 Housing

The Commodore-64 has the same plastic housing as the VIC-20, but additional ventilation slots have been added to the bottom. The new case even looks good, with its slightly pebble grain touch. The Commodore's keyboard has the same layout as the VIC's, but it's more contoured and has a nicer feel to it.

Two connectors for game controllers are on the right side of the machine, next to the power switch and the power supply connector. The power supply is still an external box similar to that used on the VIC-20.

On the back of the Commodore-64, the User Input/Output, Cassette Interface, Serial I/O and Audio/Video connectors are in the same place as on the VIC; just be aware that several pins have been redefined on the Commodore-64's User I/O and Audio/Video connectors. The RF modulator for the television interface is now built-in, and there's an extra RCA-type connector for the cable to the television antenna/game switch. There's also a small switch on the back for selecting the desired television channel.

The cartridge expansion slot on the Commodore-64 is about half the size of the VIC-20 cartridge slot, even though there are exactly the same number of pins in the new connector. The cartridge slot has guides that appear to make it easier to insert the cartridge, which is about the size of those used in the Atari 400 and 800 systems.

The Commodore-64 will accept cartridges made for the new Max Machine once it's available, but you cannot use VIC-20 cartridges in the Commodore-64.

Commodore Memory

As the name implies, the Commodore-64 does have 64K bytes of internal RAM, but, depending on how you are using the system, you may or may not be able to use all that memory. You see, the Commodore-64 still uses a 6510 eight-bit microprocessor, closely related to the 6502 used in the PET, CBM and VIC machines.

With an eight-bit microprocessor, you can address only 64K memory locations. Besides the RAM used for your programs, the microprocessor also has to address the ROM operating system that lets the system execute Basic programs. It also has to be able to address interfaces for communicating with external devices like the cassette tape or disk drives and printers. In addition, it has to manage the video screen display and keyboard.

The Commodore-64 uses some unique addressing techniques that let various memory or interfaces occupy the same address space. With a little fancy circuitry, the Commodore-64 makes maximum use of its limited 64K address space. What this means to you, the Basic programmer, is that you have only a little over 38,900 bytes for Basic programs when the system is used in its normal mode.

Several sections in the *Commodore-64 Programmer's Reference Guide* deal with internal addressing and how you can control many of the various options available. If you really want to, you can disable the Basic ROMs and various other items within the machine and gain more of the available RAM memory as needed. It probably will take some time before you understand the ideas and techniques involved and before you can make maximum use of the available features.

If you're not programming in assembly language, however, you'll probably never have to worry about things like this (at least not right away). There are enough other features to explore right now that should keep you busy for quite some time.

More Graphics . . .

One of the most impressive features of the Commodore-64 is its expanded graphics capabilities. There are a number of different character modes,

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as well as bit-mapped graphics and something new called "sprites." The new 6567 VIC-II chip is really something to marvel at.

The Commodore-64 has three modes for displaying text: standard, multicolor and extended-color. Characters are normally defined from ROM, but in each mode they can be taken from ROM or RAM. When you want special graphics characters for a program, all you have to do is define the new character shapes in RAM and tell the VIC-II chip to get its character information from there instead of from the character ROM.

In standard text mode, each character is formed in an 8×8 grid of dots. As each character is displayed, any "off" dot assumes the background color that is the same for the entire screen. Any "on" dot is displayed in the color (defined in the Color Control Memory) that corresponds to the screen location of that character.

Each character can be displayed in any of the 16 available character colors. There are several ways of selecting character colors; the most common way is to include color controls within your Print commands.

When you're using standard text graphics, all the dots within each 8×8 character can have either the background or foreground (character) color. In some ways, this limits the color resolution within each character position. In multicolor text mode, each dot can be one of four colors.

The only sacrifice is in horizontal resolution, since each multicolor character cell is treated as a 4×8 grid, with each dot being twice as wide as in standard text mode. However, standard and multicolor mode text can be mixed on the screen at the same time!

Color Your World

Extended-color text mode gives you control not only over character color, but over the background color of each individual character. In this mode, each character is treated as an 8×8 grid, just like in standard text mode. The difference is that you can now have one of four different background colors for each character. However, you're now limited to the first 64 characters in the available character set, since two bits in the character code are used to select the background color.

When writing games or plotting charts, you eventually get to the point where you want high-resolution display. The Commodore-64 provides just that through bit-mapping of the screen. Bit-mapping is a method in which each possible dot on the screen, sometimes called a pixel, is assigned its own bit within a specific location in memory. If that memory bit is a 1, the dot it represents is on; if the bit is cleared to 0, the corresponding dot is off.

The VIC-II chip supports two bit-mapped graphics modes. In the standard bit-map mode, resolution is 320 horizontal by 200 vertical dots for the whole screen. In the multicolor bit-map mode, two bits are used to define a single dot, giving a resolution of 160 by 200 dots. In either mode you'll have to set aside 8000 bytes of memory for the bit-map to control the screen graphics. Unfortunately, high-resolution graphics routines are generally too slow when written in Basic, so they're normally written in assembly language.

A Spritely Feature

The most exciting feature of the VIC-II chip is its "sprite" graphics capability. Sprites give you a way of animating your graphics displays—without the hassle of having to rewrite whole areas of memory in bit-map displays.

Sprites are essentially a special type of programmable character. All you have to do is tell a sprite "what to look like," "what colors to be" and "where to appear." The VIC-II chip will do all the rest! You can use sprites with any of the other graphics modes—bit-mapped or character, multicolored or standard. Each sprite carries its own shape, color and position definition.

Each sprite can be either standard (two colors) or multicolor (four colors) and can use any of the 16 colors. Each sprite is 24 horizontal dots (12 in multicolor) by 21 vertical dots and can be magnified two times horizontally or vertically or in both directions.

Each sprite can be turned on or off

The Commodore-64 features expanded graphics capabilities, including three modes for displaying text (standard, multicolor and extended-color). The C-64 also features music-making capabilities, made possible by the MOS 6581 Sound Interface Device chip.

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individually. Sprite priorities control what gets displayed when two or more sprites overlap. The VIC-II chip also provides sprite-to-sprite, sprite-to-text/bit-map images and sprite-to-background collision detection.

Normally up to eight sprites at a time can be maintained automatically by the VIC-II chip. You can display more sprites by using machine language and a Raster Interrupt feature; this allows you to create split-screen displays mixing text and bit-mapped data, or you can update displays outside the visible area to avoid screen flicker.

Another interesting feature of the VIC-II chip is its ability to smooth-scroll the entire screen, one pixel at a time. When in this mode, the screen size is reduced by one character space on each side and a half-character space at the top and bottom. The smaller screen size, 38 characters by 24 rows, is used to provide a place for your new data to scroll on from.

While the VIC-II chip does most of the task for you, the actual scrolling must be done by a machine-language program.

Making Music

The Commodore-64 is equipped with one of the most sophisticated electronic music synthesizers available on any computer: the MOS 6581 Sound Interface Device (SID) chip.

The SID provides three separate sound-generating sections, or "voices." Each voice is fully programmable for

Printer Power

Commodore started the new year by releasing a new printer/plotter that retails for $199.95.

The CBM 1520 Printer/Plotter uses 4½-inch roll paper and prints in four colors (or combinations of colors) to achieve multicolored graphs, charts and other types of illustrations. High-resolution graphics are achieved by the printer/plotter's ability to "step" 480 dots horizontally and up to 999 vertically. Four separate ball-point ink pens provide a clean color image, and the five-inch-wide carriage accommodates standard roll paper.

The device, designed for use with the VIC-20 or Commodore-64, is easily programmed from Basic and requires no special modification to use.

Commodore also released a new handheld computer. The Commodore HHC-4 can be used as a portable computer and full-function calculator, or it can be connected to a television for full-screen computing.■

Commodore's new CBM 1520 Printer/Plotter retails for $199.95.

tone, waveform, Attack/Decay/Sustain/Release (ADSR), filtering and modulation.

The SID is capable of providing a wide range of control over pitch (frequency), tone color (harmonic content) and dynamics (volume). The three synthesizer voices can be used independently or together to create more complex sounds. Each voice consists of a tone oscillator, waveform generator, envelope generator and amplitude modulator.

To create complex sounds using the SID chip, you'll need to take several factors into account.

First, you have to select a note frequency for the oscillator, and then a waveform type. You then select durations for the ADSR cycles and options for filter mode and frequency cutoff. Next, you set the level of volume for the composite audio output. Finally, you tell the SID to start making the sound you defined.

It sounds complicated, but it's actually easy once you've played with it a while. The *Programmer's Reference Guide* should be a big help in this area, and it includes plenty of examples.

The tonal quality of a sound is called timbre. The timbre of a sound is determined primarily by its waveform. When a note is played, it consists of a wave oscillating at fundamental frequency, as well as the harmonics of that wave. An acoustic instrument, like a guitar or violin, has a complicated harmonic structure. In fact, the harmonic structure may vary as a single note is played.

With the Commodore-64's SID chip, you can select a triangle, sawtooth or variable pulse waveform at the same time or in any combination, for each voice. By choosing carefully the waveforms used, you can create just about any harmonic structure you want. The waveform can be further refined by using the programmable filtering of the SID chip.

The programmable filter can be used to suppress or attenuate either the fundamental or the harmonic frequency outputs of each voice. You can select whether each voice is filtered, but only one set of filter parameters can be defined. They allow the selecting of cutoff or center frequency, resonance of the filter and one of four modes of operation (high-pass, low-pass, band-pass, and notch reject).

You can select one or more of the three SID voices to be filtered, or you can even filter an external audio input from the audio/video connector.

The volume of a musical tone changes from the moment you first hear it—all the way through until it dies out, when you can't hear it anymore. When a note is first struck, it increases from zero volume to its peak volume. The rate at which this happens is called the Attack.

Then it falls from its peak to a middle-range volume. The rate at which the fall of the note occurs is called the Decay. The mid-range volume itself is called the Sustain level.

Finally, when the note stops playing, it falls from the Sustain level to zero volume. The rate at which it falls is called the Release.

A sketch of the four phases of a musical note is shown in Fig. 1. Each of the items mentioned (A, D, S and R) gives certain qualities and restrictions to a musical note. The parameters Attack, Decay, Sustain and Release, collectively called ADSR, are all controllable via the SID chip.

The SID chip's parameters are controlled by 29 registers located in memory. The first 25 are "write only" registers (you write the parameters you want, but you cannot read them back later).

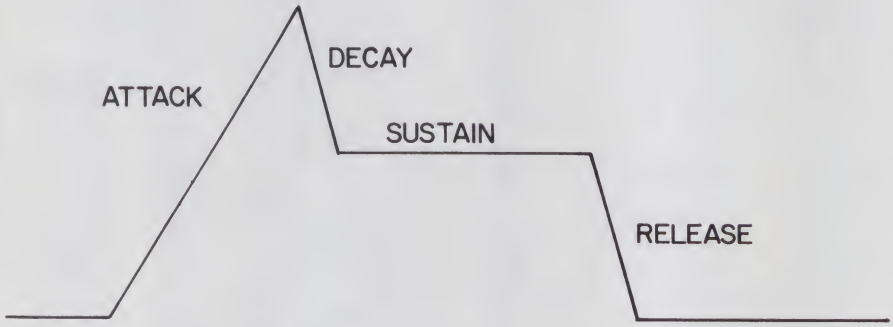

Fig. 1. Sample of four phases of a musical note.

The last four registers are read only for returning information from the SID chip. Two of these registers allow the reading of digitized outputs from the oscillator and envelope generator of the third voice. The SID chip's parameters can be changed dynamically during a note or sound to create many interesting and fun effects. You can even synchronize voices or use one voice to modulate another. (Just wait and see how quickly you get hooked on having great sound effects!)

Potpourri of Features

The Basic operating system provided in the Commodore-64 is essentially the same as that in the VIC-20; it's also similar to CBM Basic 2.0, found in earlier PETs. There are a few minor bugs you should watch out for, but most can be easily programmed around.

There have been no enhancements to Basic for the new graphics and sound capabilities, but a special cartridge that will add new Basic commands for the expanded features is being promised. Books that instruct users on how to implement graphics and sound effects are being planned as supplements to the *Programmer's*

Reference Guide.

The normal processor in the Commodore-64 is the 6510, which is exactly like the 6502 used in the VIC, PET, CBM, Apple and Atari, except that the first two bytes of page 0 are used for an on-chip I/O port. The Commodore-64 uses this port to control its memory under software control or from external game cartridges. For example, when a Max Machine game cartridge is inserted, the Commodore-64 will automatically configure itself to look just like a Max Machine. This means you could use a Commodore-64 as a simple development system for Max Machine software.

And don't forget—a Z-80 cartridge that will support the popular CP/M operating system will be released early this year. It'll be interesting to see how Commodore handles the use of disk files, since CP/M has its own methods of allocating disk space and processing disk files. Most CP/M systems use hard-sectored diskettes with a different disk formatting than that used by Commodore. Will it be possible to read CP/M diskettes from other systems?

The Commodore-64 will use all VIC-20 peripherals, including the VIC Modem, the VIC-1515/1525 printer and the VIC 1541 disk.

The older VIC-1540 disk normally will not work properly with the Commodore-64. There are two pokes you can use to get around this for most cases, but you should try to get the VIC-1541 disk. Data transfers to and from disk over the serial peripheral bus are rather slow at times (compared to the CBM 4040 and 8050 disks on the IEEE-488 bus).

The disk format used by the VIC-1541 is compatible with standard Commodore 4040 disk drives. This means that disks can be transferred among Commodore-64, PET, CBM and VIC-20 owners.

When using a VIC-1541 disk with the Commodore-64, keep in mind that the disk is a "smart peripheral"—the Disk Operating System (DOS) is actually in the disk drive and not in the computer. The version of Basic in the Commodore-64 does not include the newer CBM Basic 4.0 disk commands.

All disk commands must be sent to the disk over something called the command channel. This makes usual disk maintenance (for example, renaming, deleting or copying) a little more difficult than normal. However, a version of the familiar DOS Wedge should be coming soon from Commodore; this should make handling of the disk much less painful.

> In my opinion, the Commodore-64 is an excellent value, and early sales figures back this up

Many PET programs will work on the Commodore-64 with little or no modification. Programs that poke screen locations must be changed, since the screen memory has moved. A few people have developed easy formulas for converting CB2 sound effects from the PET so the program can use the SID chip on the Commodore-64.

Commodore plans to release what it calls a PET emulator for the Commodore-64, but you'll probably find it nicer just to convert the programs instead. VIC-20 programs may run on the Commodore-64 if they don't rely on the 22-column display and if they don't use the VIC graphics or sound.

In my opinion, the Commodore-64 is an excellent value, and early sales figures back this up. For only $595, you get powerful graphics that approach those of the Apple and the Atari, a complete sound synthesizer unlike anything else available and 64K of memory in a compact system.

My only complaint so far is the quality of the video image produced. For some reason, the characters seem to be "smeared" on the display when certain color combinations are used. A number of comments have been made about this in various magazines and on the Commodore Network on Compuserve. Commodore, however, should be able to clean this up a bit in time.

For now, I just hope I can keep everyone away from the Commodore-64 I have on loan—long enough for me to use it. My son doesn't even want to touch the VIC-20 anymore. . . ■

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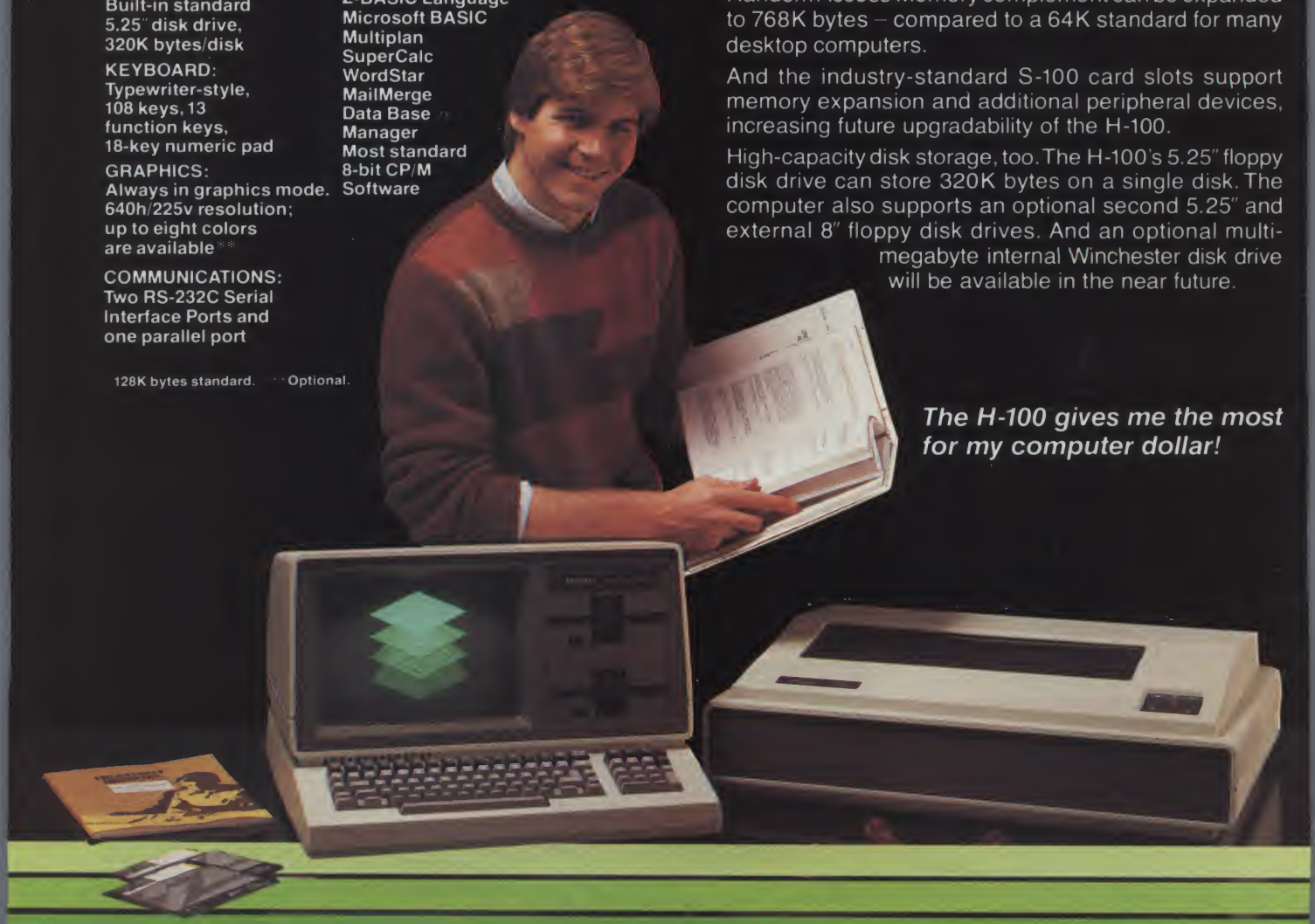

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8-bit:	8085	–	6502
RANDOM ACCESS MEMORY:			
Minimum:	128KB	16KB	128KB
Maximum:	768KB	576KB	256KB
FLOPPY DISK STORAGE:			
Per Diskette:	320KB	320KB	140KB
Maximum Internal:	640KB	640KB	140KB
8" Floppy Support:	Standard	—	—
EXPANSION SLOTS:	Five S-100 (four available)	Five (three available)	Eight
I/O PORTS:			
Parallel:	1	Optional	–
Serial:	2	Optional	1
VIDEO DISPLAY:			
Line Columns	25 x 80	25 x 80	24 x 80
Pixels Colors	640 x 225 (8 colors)	640 x 200 (2 colors) 320 x 200 (4 colors)	560 x 192 (16 colors)
OPERATING SYSTEMS:	CP/M-85, Z-DOS (MS-DOS)	CP/M-86 PC-DOS (MS-DOS) UCSD P-System	Apple SOS

Information current as of 8/31/82. · External disk storage available soon.

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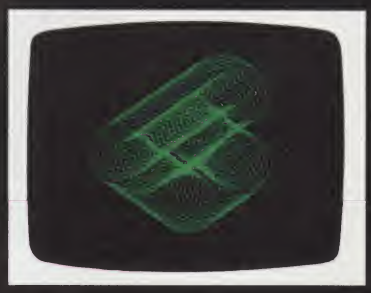

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The Super Tweenie

Here's a useful gadget that you can build to hook up computers and peripherals.

By George M. Ewing

I have kludged together a useful gadget for hooking up computers, modems, Teletypes and printers. The Super Tweenie version in the photo is for RS-232 serial ports using the DB-25 connector, but you could easily put together other versions for any connector where a number of wires have to be hooked up and tested.

The basic idea is simple—bring out the various pins of the mating connector to some kind of breadboard, where you can try jumpers connecting various handshaking lines, and use meters or logic probes to deterimine what's happening on a given line. (See Fig. 1.)

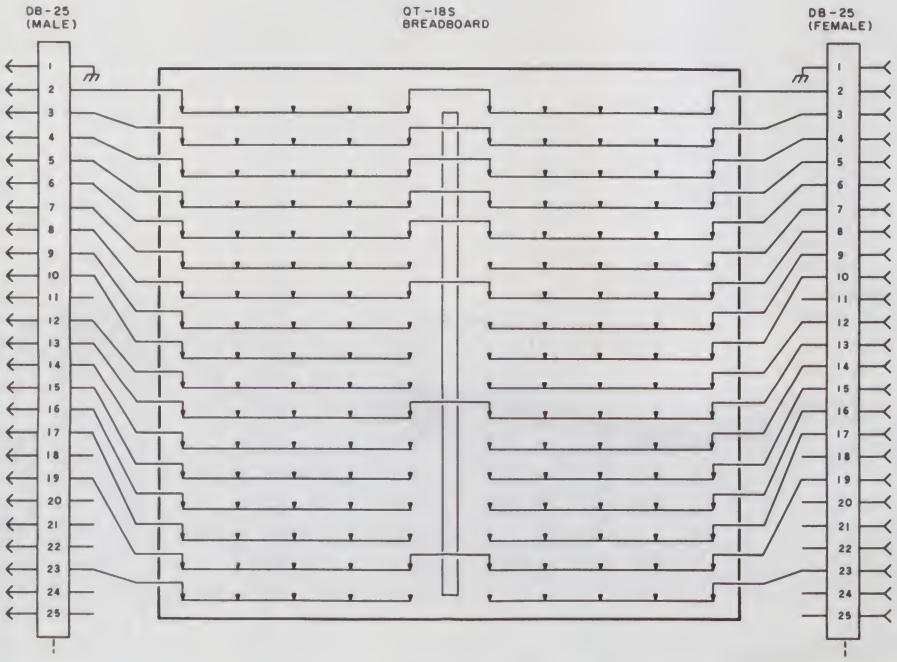


Fig. 1. Typical hookup with eight jumpers and chassis ground.

I constructed this version from a small breadboard socket, a piece of aluminum scrap bent into a U-shaped chassis and a pair of DB-25 connectors (one male and one female). The gadget is smaller than a pack of cigarettes, contains 18 lines of socket holes for jumpers and testing, and can be plugged directly into the back of many devices.

If the connectors on the equipment you will be using are hard to reach, bring a couple of short pieces of cable out from the box, and mount the two connectors on the ends so the breadboard can lie flat on the workbench while it remains plugged into the ports to be checked.

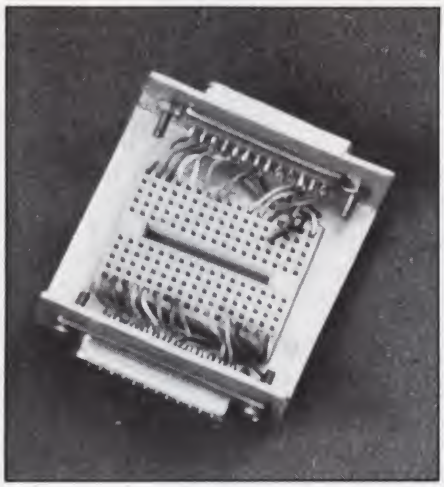
You can use almost any sort of breadboard or socket, but Global Specialties' (70 Fulton Terrace, Box 1492, New Haven, CT 06509) line of prototyping sockets seems to be especially handy (see Table 1). Since very few DB-25 hookups use all 25 pins, the 18-row version (QT-18S) is usually adequate. It lists for about $4.50 in small quantities. Depending on how much you pay for the DB-25s, you ought to be able to put the box together for $10–12. It will cost less if you can scrounge a

Address correspondence to George M. Ewing, 366 Cloverdale, Ann Arbor, MI 48105.

couple of surplus connectors.

If you want to build a unit for all 25 possible pins, for larger connectors like the DB-50, or for 44-pin edge connectors used in some hobby computer interfaces, you can use one of the bigger sockets or put a pair of the smaller ones on the chassis end-to-end.

With the help of this gadget and a good table showing the pin connections for the RS-232 or other bus (see Table 2), you can quickly figure out handshaking problems. Other helpful items would include a small logic probe or voltmeter, and perhaps a 9 V dc transistor radio battery and a couple of jumpers—so you can deliberately pull a handshake line high or low and hold it that way while you check other combinations. ■



The Super Tweenie interfaces an RS-232 port using a DB-25 connector.

Reference

EIA Standard RS-232-C: Interface Between Data Terminal Equipment and Data Communications Equipment Employing Serial Binary Data Interchange. (1969) Electronic Industries Association, Engineering Dept., 2001 Eye St. NW, Washington, DC 20006.

Type	Pins	Catalog Price
QT-18S	10×18	about $4.50
QT-35S	10×35	about $7.00
QT-47S	10×47	about $9.00
QT-59S	10×59	about $11.00

Table 1. Global Specialties Corp. prototyping sockets.

Pin	Circuit	Function	Source	Type
1.	AA	Protective Ground	gnd.	gnd.
2.	BA	Transmit data from terminal	terminal	data
3.	BB	Receive data to terminal	modem	data
4.	CA	Request to send	terminal	control
5.	CB	Clear to send	modem	control
6.	CC	Data set ready	modem	control
7.	AB	Signal gnd.	gnd.	gnd.
8.	CF	Carrier detect	modem	control
9.	–	Positive test voltage	–	–
10.	–	Negative test voltage	–	–
11.	–	Unassigned	–	–
12.	SCF	Secondary carrier detect	modem	control
13.	SCB	Secondary clear to send	modem	control
14.	SBA	Secondary transmit data	terminal	data
15.	DB	XMT clock pulse	modem	timing
16.	SBB	Secondary receive data	modem	data
17.	DD	RCV clock pulse	modem	timing
18.	–	Unassigned	–	–
19.	SCA	Secondary request to send	terminal	control
20.	CD	Data terminal ready	terminal	control
21.	CG	Signal error detect	modem	control
22.	CE	Ringing line	modem	control
23.	CH/CI	Baud rate select	terminal/modem	control
24.	DA	Xmit clock pulse (neg. edge)	terminal	timing
25.	–	Unassigned	–	–

Table 2. Typical RS-232C configuration. These designations are compiled from various manufacturers' specifications and are only a general guideline. Individual equipment manufacturers often don't follow them for every pin. An Okidata 82A printer, for example, refused to work properly with my H-89 computer until the CA line from pin 4 on the computer port was jumpered to pin 11 on the printer, which is shown as "Unassigned" on the chart but as an "SSD" line in the Okidata manual. For the complete RS-232C standard, find the article reference in any good engineering library.

CBasic's Super Sleuth

Need to track down what variables, functions and subroutines occur in what lines in your source program? This cross-reference utility will solve the case in a flash.

By James Monagan

CBasic program to generate cross-reference listing for CBasic source programs.

```
    1:        PRINT:PRINT"CROSSREF   -   CBASIC VERSION
    2:        PRINT:PRINT"                    BY JAMES MONAGAN"
    3:        PRINT:PRINT"LISTS ALL VARIABLES & REFERENCED LINE #'S"
    4:        PRINT"-----------------------------------------"
    5:
    6:        FF$=CHR$(12)
    7:        C$="----------":FOR I=1 TO 7:SSS$=SSS$+C$:NEXT
    8:
    9:        DIM RWS$(100),PT%(25)
   10:        SC=500:SK=91:SN=SK-26:SA=SN+1-ASC("A")
   11:        DIM VNXT%(SC+SK),V$(SC+SK),FRST%(SC),LST%(SC),RFL%(5*SC),NXT%(5*SC)
   12:
   13:        REM      RESERVED WORDS
   14:
   15:        DATA ABS,AND,ASC,AS,ATN,CALL,CHAIN,CHR$,CLOSE,COMMON
   16:        DATA CONSOLE,COS,CREATE,CRUN,DATA
   17:        DATA DEF,DELETE,DIM
   18:        DATA ELSE,END,EQ,EXP,FEND,FILE,FOR,FRE
   19:        DATA GE,"GO SUB","GO TO",GOSUB,GOTO
   20:        DATA IF,INPUT,INP,INT,LEFT$,LE,LEN,LET,LINE
   21:        DATA LOG,LPRINTER,LT,MATCH,MID$
   22:        DATA NE,NEXT,NOT,ON,OPEN,OR,OUT
   23:        DATA PEEK,POKE,POS,PRINT,RANDOMIZE,READ,RECL
   24:        DATA REM,REMARK,RENAME,RESTORE,RETURN,RIGHT$,RND
   25:        DATA SGN,SIN,SIZE,SQR,STEP,STOP,STR$,STRING$
   26:        DATA TAB,TAN,THEN,TO
   27:        DATA USING,VAL,WEND,WHILE,WIDTH,XOR,~
   28:
   29:        REM      FILL ARRAY WITH RESERVED WORDS
   30:
   31:        RW=0
   32: 300    READ RW$
   33:        RW=RW+1:RWS$(RW)=RW$
   34:        IF RW$="~" THEN 350
   35:        I=ASC(RW$)-ASC("A")
   36:        IF PT%(I)=0 THEN PT%(I)=RW
   37:        GOTO 300
   38:
   39: 350    FOR I=0 TO 25
   40:        IF PT%(I)=0 THEN PT%(I)=RW
   41:        NEXT
   42:
   43:        REM      GET SOURCE FILE NAME
   44:
   45:        F=1
   46: 410    PRINT:INPUT " CBASIC SOURCE FILE NAME = ";LINE F$
   47:        IF F$="" THEN STOP
   48:        IF MATCH(".",F$,2)=0 THEN F$=F$+".BAS"
   49:        IF END #F THEN 410
   50:        OPEN F$ AS F
   51:
   52:        PRINT:INPUT"INCLUDE '%INCLUDED' PROGRAMS  (Y/N) ";C$
   53:        IF MID$(C$,1,1)="Y" OR MID$(C$,1,1)="y" THEN INC=1 ELSE INC=0
   54:        PRINT:INPUT"DATE = ";D$
   55:        PRG$="'"+F$+"'   -   "+D$
   56:
   57:        GOSUB 610
   58:        LPRINTER:PRINT FF$:CONSOLE
   59:        STOP
   60:
   61:        REM      INITIALIZE FOR CROSS REFERENCE
   62:
   63: 610    LC=0:PZ=0:V$="":C$="":VC=SK:RC=-1
   64:        FOR I=0 TO SK:VNXT%(I)=-1:NEXT
   65:
```

More →

When you modify a program, a cross-reference listing can be as handy as a complete set of flowcharts or almost as handy as the source listing itself. This is because of the listing's detailed picture of variable, function and subroutine usage. This detailed picture is difficult to obtain by just looking at the source listing.

The accompanying program will scan a CBasic source program and generate a complete cross-reference listing, including all line numbers referenced in GOTO, GOSUB and IF...THEN statements, together with a list of all the referencing line numbers. It also includes a sorted list of all the variables used in the program together with the numbers of all the lines in which each variable is used.

The cross-referencing of line numbers clarifies the program's interconnections by showing where subroutines are called and where jumps are made. It helps clarify variable usage by showing every line in which a variable is used.

Program Operation

Program operation is simple. There are only three inputs: the name of the CBasic source file, the date to appear on the cross-reference listing and the choice of whether or not to include source programs specified in %INCLUDE statements.

Normally the choice will be to in-

Address correspondence to James Monagan, 806 Clark St., Iowa City, IA 52240.

Listing continued.

```
  66: 630     IF END #F THEN 1200
  67: 650     IF F=1 THEN LN$=':' ELSE LN$='='
  68:
  69:         REM     INPUT SOURCE LINE
  70:
  71: 670     READ #F;LINE L$
  72:         LG=LEN(L$):BRNCH=0:LC=LC+1
  73:         LP=0:LN=LC:PRINT STR$(LN);LN$
  74:
  75:         REM     CHECK FOR COMPILER DIRECTIVES
  76:
  77:         IF INC=0 OR MATCH('%INCLUDE',L$,1)<>1 THEN 700
  78:         LP=9
  79: 690     C$=MID$(L$,LP,1)
  80:         IF C$<'A' AND C$>'' THEN LP=LP+1:GOTO 690
  81:         F$=MID$(L$,LP,14)
  82:         IF F$='' THEN 670
  83:
  84:         REM     OPEN INCLUDED SOURCE FILE
  85:
  86:         PRINT L$
  87:         IF END #F+1 THEN 670
  88:         OPEN F$ AS F+1:F=F+1:GOTO 630
  89:
  90: 700     IF MID$(L$,1,1)='%' THEN 670
  91:
  92:         REM     PARSE LINE
  93:
  94: 750     LP=LP+1
  95:         IF LP>LG THEN GOSUB 1010:GOTO 670
  96:         C$=MID$(L$,LP,1)
  97:         IF C$>='A'AND C$<='Z'THEN 1110
  98:         IF C$>='a'AND C$<='z'THEN C$=CHR$(ASC(C$)-32):GOTO 1110
  99:         IF C$>='0'AND C$<='9'THEN 1150
 100:         IF C$=' ' OR C$=CHR$(9) THEN GOSUB 1010:GOTO 750
 101:         IF C$='.' AND V$>'' THEN 1120
 102:         IF C$='\' THEN GOSUB 1010:GOTO 670
 103:         IF C$<>','THEN BRNCH=0
 104:
 105:         IF C$<>CHR$(34)THEN 780
 106:         GOSUB 1010:LP=MATCH(C$,L$,LP+1)
 107:         IF LP>0 THEN GOTO 750 ELSE GOTO 670
 108:
 109: 780     IF C$='$'OR C$='%' THEN 1130
 110:         GOSUB 1010
 111:         GOTO 750
 112:
 113:         REM     TEST FOR COMMAND
 114:
 115: 890     C=ASC(V$):P=PT%(C-ASC('A')):BRNCH=0:RW$=''
 116:
 117: 900     IF C<ASC(RWS$(P)) THEN RETURN
 118:         IF V$<>RWS$(P) THEN P=P+1:GOTO 900
 119:         RW$=V$
 120:         IF V$='DATA' OR V$='REM' OR V$='REMARK' THEN LP=LG+1:RETURN
 121:         IF V$='GOTO' OR V$='GOSUB' OR V$='THEN' THEN BRNCH=1
 122:         RETURN
 123:
 124:         REM     END VARIABLE
 125:
 126: 1010    IF V$=''THEN RETURN
 127:         IF ASC(V$)<ASC('A') THEN 1030
 128:         GOSUB 890
 129:         IF RW$>'' THEN V$='':RETURN
 130:         IF C$='(' THEN V$=V$+C$
 131:         C=ASC(V$)+SA:IL=-1:I=C
 132: 1020    IF LEFT$(V$+'          ',9)<=LEFT$(V$(I)+'          ',9) THEN 1050
 133:         IL=I:I=VNXT%(I)
 134:         IF I>0 THEN GOTO 1020 ELSE GOTO 1060
 135:
 136: 1030    IF VAL(V$)<1000 THEN C=INT(VAL(V$)/100) ELSE C=9+INT(VAL(V$)/1000)
 137:         IF C>SN THEN C=SN
 138:         IL=-1:I=C
 139: 1040    IF VAL(V$)<=VAL(V$(I))THEN 1050
 140:         IL=I:I=VNXT%(I)
 141:         IF I>0 THEN GOTO 1040 ELSE GOTO 1060
 142:
 143: 1050    IF V$<>V$(I) THEN 1060
 144:         J=LST%(I-SK)
 145:         IF RFL%(J)=LN THEN GOTO 1090 ELSE RC=RC+1:NXT%(J)=RC:GOTO 1080
 146: 1060    VC=VC+1
 147:         IF IL>=0 THEN VNXT%(IL)=VC
 148:         V$(VC)=V$:VNXT%(VC)=I:RC=RC+1:FRST%(VC-SK)=RC:I=VC
 149: 1080    RFL%(RC)=LN:NXT%(RC)=-1:LST%(I-SK)=RC
 150: 1090    V$='':RETURN
 151:
 152:         REM     EXPAND VARIABLE
 153:
 154: 1110    IF VAL(V$)>0 AND VAL(V$)=VAL(V$+MID$(L$,LP,255)) THEN GOSUB 1020
 155: 1120    V$=V$+C$:GOTO 750
 156: 1130    IF V$<>''THEN V$=V$+C$
 157:         GOTO 750
 158: 1150    IF V$>'' OR BRNCH>0 THEN V$=V$+C$
 159:         GOTO 750
 160:
 161:         REM     END OF SOURCE FILE
 162:
 163: 1200    CLOSE F
 164:         IF F>1 THEN F=F-1:GOTO 650
 165:
 166:         REM     PRINT SYMBOL TABLE
 167:
```

More

clude these programs, so that the line numbers computed by the cross-reference program will agree with the complete source listing generated by the CBasic compiler. Program output consists of a printed cross-reference listing for the specified source program.

The program starts by reading the alphabetically sorted list of reserved words into the array RW$. The array PT% is set so that the elements PT%(0) through PT%(25) point to the first reserved words beginning with the letters A through Z. This primitive hashing scheme allows for faster searches in the reserved word array.

Thus a search for the word BOD would begin with RW$(PT%(1)) and continue until BOD is found in RW$ or a reserved word greater than BOD is encountered. Thus it is necessary that the last element in RW$ be greater than Z. I used the tilde (~) as the last element, but any character with ASCII value greater than Z will do.

After accepting the three inputs from the operator, the program proceeds to read and parse each line of the specified source file. To entertain the operator, the number of the line currently being parsed is printed on the screen. Lines are parsed a character at a time.

Words and numbers can easily be distinguished from quoted strings and other language elements. Numbers are ignored unless they appear as statement labels or follow one of the reserved words: GOTO, GOSUB or THEN. Words are ignored if they appear in the list of reserved words. The rest of a line following a REM, REMARK or DATA is also ignored.

Words and numbers that are not ignored are considered symbols to be found in the symbol table, V$. If they are not already in the symbol table, then the program adds them to it. The line number in which the symbol occurred is added to the array RFL%. (However, only one entry is made if a symbol occurs more than once in a given line.)

When every program line has been read and parsed, each element in the symbol table and its associated line numbers from the array RFL% are printed out. Because of the pointers that are maintained linking the symbols and their referencing line numbers, no sorting of the symbol table is required prior to printing the cross-reference listing.

To speed up symbol table searches, the symbol table, V$, is organized as a set of 92 distinct symbol chains. The first ten chains start at V$(0) through V$(9) and are used for numerical symbols from 0xx through 9xx.

The chains starting at V$(10) through V$(65) are used for numerical symbols from 01xxx through 64xxx, while the chains starting at V$(66) through V$(91) are used for alphabetical symbols starting with the letters A through Z. Thus the symbol 800 would be placed in the chain starting at V$(8), and the symbol BRNCH would be placed in the chain starting at V$(67).

The links in each symbol table chain are stored in the array VNXT%, so that the symbol following V$(I) is V$(VNXT%(I)). If VNXT%(I) is negative, then V$(I) is the last element in the chain. Otherwise, VNXT%(I) points to the next symbol in the chain, VNXT%(VNXT%(I)) points to the following symbol, and so on.

For each symbol V$(I), a chain of reference line numbers is stored in the array RFL%. The first element in this chain is RFL%(FRST%(I)), and the last element is RFL%(LST%(I)). The links in this chain of line numbers are stored in the array NXT%, so that the second line number in the chain would be RFL%(NXT%(FRST%(I))).

Suppose the symbol V$(J) has been found in line LN. The program will first test to see if LN = RFL%(LST%(J)). If so, this symbol has already been recorded and no additional entry would be made. Otherwise, the program sets RC equal to the next unused element in RFL%, and sets RFL%(RC) = LN, VNXT%(LST%(J)) = RC and LST%(J) = RC.

Printing out the cross-reference listing just requires following each of the symbol table chains to its end. After each symbol is printed, the associated chain of reference line numbers is also printed.

To understand the linkage in the symbol and reference line arrays, I recommend studying the print routine before looking at the search and insertion routines. Note that although all symbols are entered in the symbol table as they appear in the program, alphabetical symbols are padded or truncated to a uniform nine-character string before any comparisons are made. This ensures that string comparisons will be based on a character by character ASCII comparison, rather than on string length.■

Listing continued.

```
  168:        PZ=0:LPRINTER WIDTH 80:GOSUB 1400:SZ=-1
  169:        FOR J=0 TO SK:V=J
  170: 1230   V=VNXT%(V)
  171:        IF V<0 THEN 1340
  172:        IF LZ>56 THEN GOSUB 1400:GOTO 1250
  173:        SZ=SZ+1
  174:        IF SZ=3 THEN GOSUB 1410
  175: 1250   RZ=0:I=FRST%(V-SK):PRINT V$(V);
  176: 1260   IF RZ=0 THEN PRINT TAB(16);
  177:        LN=RFLX(I)
  178:        PRINT USING"      ####";LN;
  179:        RZ=RZ+1
  180:        IF RZ<6 THEN 1280
  181:        RZ=0:PRINT:LZ=LZ+1
  182:        IF LZ>56 THEN GOSUB 1400
  183:
  184: 1280   I=NXT%(I)
  185:        IF I>0 THEN 1260
  186:        IF RZ>0 THEN PRINT:LZ=LZ+1
  187:        GOTO 1230
  188: 1340   NEXT J
  189:
  190:        PRINT SSS$
  191:        PRINT"LINES:";LC;"    SYMBOLS:";VC-SK;"    REFERENCES:";RC+1
  192:        LZ=LZ+2:RETURN
  193:
  194: 1400   GOSUB 1520:PRINT"SYMBOL";TAB(20);"REFERENCE LINE":LZ=LZ+1
  195: 1410   PRINT SSS$:LZ=LZ+1:SZ=0:RETURN
  196:
  197:
  198: 1520   PRINT FF$
  199:        PZ=PZ+1:PRINT TAB(72);"PG#";PZ
  200:        PRINT PRG$:PRINT
  201:        LZ=3:RETURN
  202:
  203:        END
NO ERRORS DETECTED
CONSTANT AREA:      8
CODE SIZE:       2613
DATA STMT AREA:   449
VARIABLE AREA:    336
```

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A Fearless Look At Micro Changes

By Daniel H. Marcellus

The feeling that a new generation of personal computers is just around the corner has caused many computerists to resist making purchases of new equipment for their eight-bit systems. Some have been waiting in this state for several years, and finally, it seems as if big happenings with new systems and new software are on the way.

A Cycle in Sight

By studying the way computer systems have developed, we might be able to perceive a cycle. On the coarsest scale, there's always been a pattern in which the hardware industry would sprint ahead, software would catch up, the hardware would make a new advance and so on. The result: the computer industry has always been hardware-driven.

If we look at eight-bit microcomputer systems, four stages of development can be discerned.

In an early stage, revolutionary hardware was produced, but not much software was available. Then came a time when processor hardware became stabilized and some powerful software was developed. Next came a phase of integration; systems were tuned and hardware and software wore in together and became mature. Finally, there was a post-maturity baroque phase in which designers tried to stretch the inherent power of their equipment with unusual architecture and tricky programming.

The time scale of these developments spans from about 1973 to 1981 in roughly two-year increments. Perhaps we are still in the baroque phase with respect to eight-bit processors. Sixteen-bit processors may well follow the same type of cycle.

The period 1979–1981 should be chalked up to hardware development of 16-bit processors, and the period 1981–1983 for software development. The period 1983–1985 is slated for mature systems that will reflect the true power of 16-bit processors with good software. (Fig. 1 shows this type of chronology, along with important benchmark events.)

A Revolution?

If these ideas are correct, it means that, in the next few years, we can look for some innovative and unusual designs with eight-bit processors, plus some powerful software for 16-bit processors. A little further down the road, look for some revolutionary systems

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based on 16-bit processors. These systems will incorporate all the new power and all that was learned in the previous cycle with eight-bit processors.

Now, in order to flesh out these ideas a little, I'd like to examine in more detail some developments that appear to be just over the horizon in software and systems.

The hardware world in the next few years will consolidate the spectacular gains of recent years. Sixteen-bit processors will be debugged, extended and put into common use. Prices will come down, support chips will be developed for new processors and memory chips will become denser. Single-chip microcomputers will have more and more features consolidated onto the single chip. Eventually, many of the standard processors, peripherals and memory chips will be brought out in CMOS versions.

These things are normal technological evolution, but so far there are no hints of a revolution. So where can we look for one? How about in software?

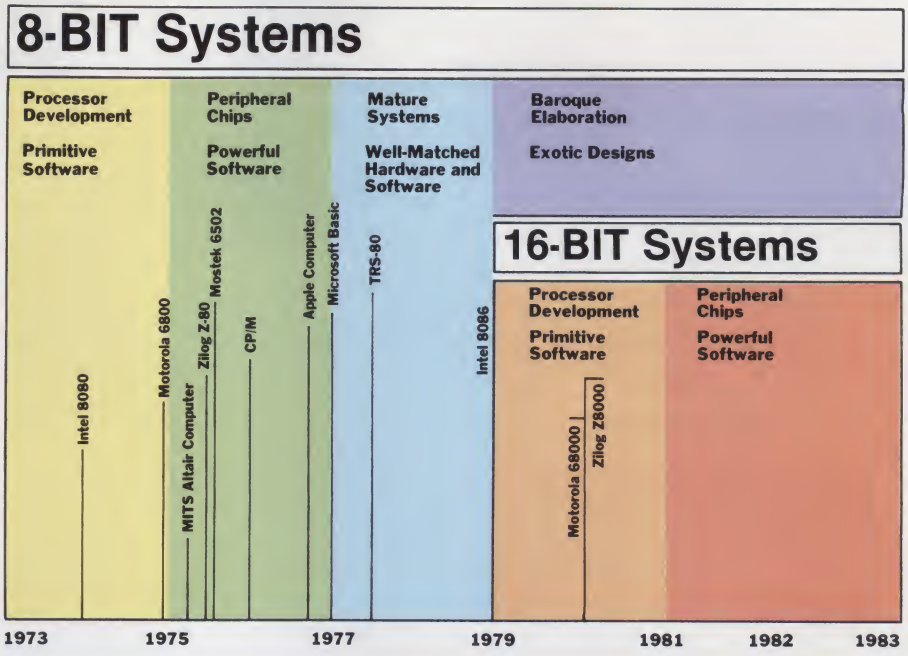


Fig. 1. Stages in development of microcomputer systems.

Trends in Software

It's easy to get used to amazing increases in functionality in hardware, but it's not so easy with software. The software world is more conservative and slower to change than the hardware world.

Classical techniques are still viable for work in operating systems and programming languages. In fact, hardware engineers have been known to grumble periodically about getting into software so as not to become obsolete within five years after they graduate.

Nonetheless, there are times when software does change with relative rapidity. Now is one of those times. A whole bunch of new hardware features has been presented for the use of systems software, and systems programmers are rising to the challenge.

One change in particular will open a new dimension for software development: an increase in addressing range (which all the new processors have) beyond the traditional 64K. (Table 1 documents this new resource for some of the familiar 16-bit processors.)

Here are some developments we'll soon be seeing in software for small computers:

1. New microcomputer systems will be supplied with much more systems software in ROM than before. A computer of Apple II vintage typically has offered about 16K of software in ROM. This was all that could be afforded, because the total memory space for all programs is only 64K.

The new IBM Personal Computer has 40K of systems programs in ROM. This is possible because that machine is implemented with a total address space of 256K.

ROM has many advantages. It's cheaper than RAM, so a low-end machine without much RAM memory can still be given large capabilities. Software in ROM is also fully installed on power-up and cannot be destroyed by errant programming.

Some new microprocessors will have an entire operating system in a ROM on the processor, or on an auxiliary chip made to operate in close proximity with the processor. The Intel iAPX-86/30 two-chip set is the only microprocessor using this concept at present. It's not clear whether this will become popular or not.

2. Languages for microcomputers will continue to evolve. Since the languages can be larger (because of more address space on the new computers), their functionality will increase tremendously. Standard languages like Fortran and Cobol, which were hard to run in a 64K address space, will make a more significant penetration into the microcomputer world.

The languages that will experience the most growth will be those that are not standardized—like Basic. The new IBM version, for example, has been greatly extended with all kinds of features because there is now more space for a larger Basic interpreter.

It's likely that Basic will keep its interactive nature and easy usability but will evolve to have features that make it easier to debug and maintain programs. It's easy to add the structured programming control constructs to a Basic-type language, so this will probably be done in most new versions of Basic.

Other things that would be useful are: specific declarations for all variables that will be used, linkable code to aid modular programming and better commenting procedures. Basic programs currently are hard to read. Comments are not often used, because in an interpretive language the comments generally stay with the code at execution time and soak up memory. With a larger memory space, this is less of a problem.

Finally, the idea of having an interpretive version of a language for program development and a compiled version for production programs has been successful—particularly with Ba-

Sixteen-bit	Megabytes
Intel 8086	1
Zilog Z8000	8
Motorola 68000	16

Table 1. Direct addressing range of the most common 16-bit processors. This is the amount of memory that can be directly and easily used by a programmer without having to resort to something equivalent to a bank-switched memory.

sic. This dual environment is probably the best way in which applications can be developed. We can look for it to be extended to other languages.

3. More programs from the artificial intelligence community will come into the repertoire of common software for microcomputers. We're seeing this happen now with VisiCalc and with programs for symbolic mathematics, such as MuSimp. This type of programming is memory intensive, so its use has been limited with smaller microcomputers, but the constraints of the memory address space are about to be unleashed.

In particular, it appears that automatic programming will see a lot of use for certain classes of programs. The aim of this kind of technology is to use one computer program to write another. Instead of a programmer producing the code, he answers questions at his terminal and the computer uses this information to automatically generate the required program.

Automatic programming is easiest to apply to those types of situations where a relatively low number of standard procedures are done in sequence in the target program. Business applications have this character.

Business programs usually provide these features:

- The setting up of forms on a terminal screen.
- The passing back and forth of information that corresponds to the filling of the blanks on the terminal screens.
- The reading and writing of records to files.

We will probably soon see program generators which engage the user in dialogue that narrows down what he wants to do. Then some tailored sequence of modules is generated. The result is an executable program. These modules will set up all the screens, prompt the user for I/O and do the file manipulations of simple business applications (for example, The Last One and Quic-and-Easi, which both generate target programs in Basic).

4. Microcomputer time-sharing operating systems that support multiple, concurrent users are now in use and will become even more common. (An example of such a system presently available for eight-bit computers is MP/M-II from Digital Research.) These kinds of operating systems will be used a lot; such systems are the staple of sale for a number of minicomputer manufacturers.

There are now microcomputers that are more powerful and a lot cheaper than standard minis, so they'll certainly be able to support minicomputer-type operating systems. In the future, expect to see many cost-effective vari-

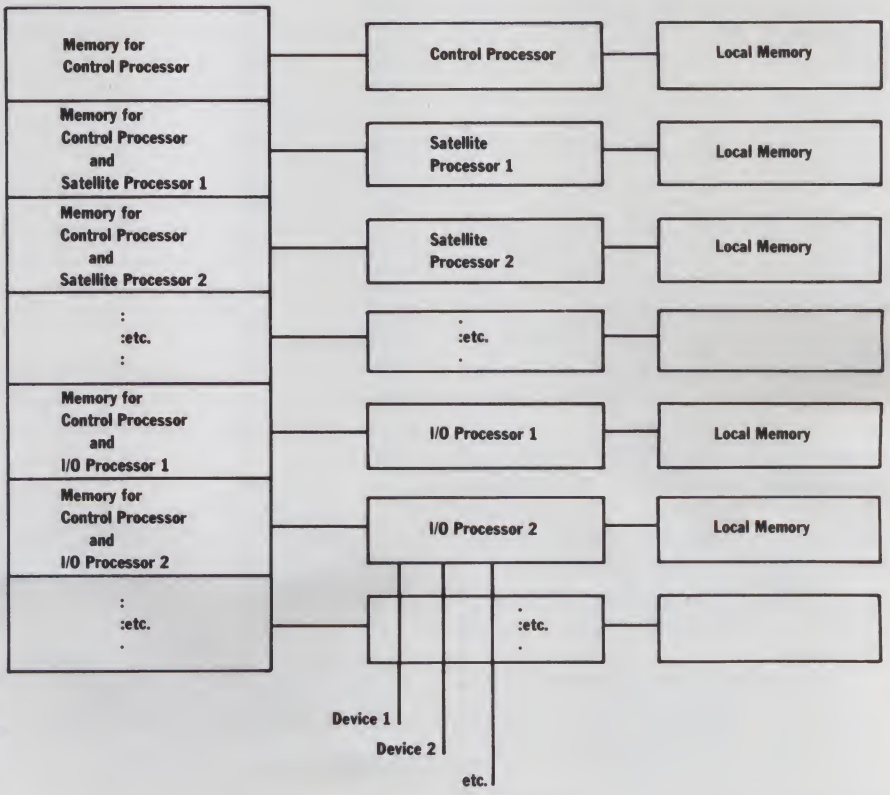


Fig. 2. Mainframe built from microcomputers.

ants of small-business systems based on this minicomputer operating-system technology and using 16-bit processors.

5. Someone probably will develop a single-user virtual memory operating system for a personal computer. The idea of virtual memory is that the whole program doesn't have to be in memory at once to execute; only the local region around the point of execution has to be in memory.

If an address reference is made to part of the program that is not in the memory, a piece of hardware detects this, and program execution is suspended. Some combination of hardware and software brings the needed part of the program into memory, perhaps overwriting some other part that is needed less immediately. And then program execution resumes where it left off.

This process could be slow in a microcomputer, but it would let large programs be run directly in a personal computer. (Isn't this a nice idea?) For many applications, it's not going to matter if the program is executing at only one-twentieth or one-fiftieth the speed of a mainframe. It's your computer and you can let it run overnight.

Two advanced types of hardware are necessary for this kind of system.

One is a fast, cheap, high-capacity Winchester disk, which is available now. The other is a type of paging hardware that can detect references to parts of a program that are not in memory and put them there rapidly from the disk. This hardware already exists for large systems and is just around the bend for small systems.

Some examples: Morrow Computing is advertising something that sounds like a virtual memory for its multi-user, Z-80-based small business system. And Zilog has recently announced a memory-management chip that can work in conjunction with the Z8003 16-bit microprocessor to implement true, IBM-370 style, virtual memory with program paging. Motorola's new MC68010 will do the same for up to four gigabytes of virtual memory.

Trends in Systems

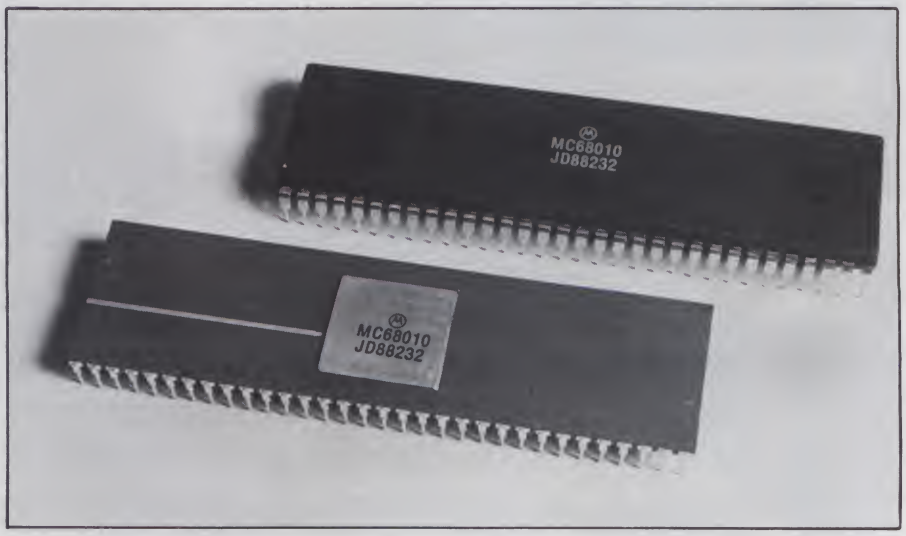
Sometimes an evolutionary change in software, coupled with an evolutionary change in hardware, will produce a system that seems to perform in a revolutionary manner. At least one of the changes mentioned below is of that sort.

I believe, however, that one single factor, more than any other, will condition the way new systems will look in the next few years. People will finally learn how to use multiple processors together in all kinds of cooperating aggregates.

Here are some of the new system features that should be making strong appearances soon:

1. The 16-bit microprocessor in personal computers will finally arrive in a big way. The IBM personal computer uses an Intel 8088 processor, which is really a 16-bit machine.

To compete with this equipment, the other makers of small computers will come out with their own 16-bit designs. They won't be much more expensive than current eight-bit de-



Motorola's MC68010 helps to implement virtual memory with program paging for up to four gigabytes of memory.

signs because the CPU is not the major expense item in a microcomputer.

2. For at least some of the new microprocessors, expensive development systems will no longer be necessary to integrate the processor into a hardware design.

A development system consists of a microcomputer with floppy disks for software development, plus a logic analyzer and an in-circuit emulator for debugging the design. At least some new processors will follow the lead of the revolutionary Zilog Z-8 single-chip microcomputer, which has an on-chip Basic interpreter specialized for control applications.

The idea is to permanently cast the development software right on the chip in a ROM. Then all the designer needs to do to develop an application is to attach a terminal and use the software already on the chip for program editing and for testing the features of the prototype.

After the program is developed and the hardware is checked out, the terminal is no longer needed. The program is put in an EPROM, and the electronics can be packaged in whatever target configuration is desired.

This should make microcomputing even more of a cottage industry than it is right now. The Gross National Product needs more people starting two-person companies in garages.

3. Someone will produce dedicated word processing equipment that will be sellable for much less than present systems.

Word processing is one of the most useful ways in which the general public comes in contact with microcomputer equipment. There will be a tremendous demand for it, but now it is just too expensive. Today, a system with two floppy disks and a dot matrix printer costs in the neighborhood of $4000 (if based on a personal computer) to $6000 (if purchased from one of the word processor companies). Designs with new generation equipment will yield a competent system that can be put together for about $1250 and sold profitably for $2500.

What would such a low-end word processor be like?

It would probably use several single-chip microcomputers to divide the work—one to handle the screen, one for I/O and one to do word processing computations. It would probably have a lot of memory; memory is getting cheaper and sufficient memory buffers make for a fast word processor. All its software would be in ROM. The keyboard and the software would be designed together so that there could be special keys to easily invoke program functions.

The system would incorporate a cheap dot matrix printer of letter quality—something like the next generation beyond an Epson MX-80.

And now a surprising feature—the machine would be set up, as much as possible, to work with just one high-capacity floppy disk, holding perhaps one megabyte. This would keep the price down. The only bad thing about this design is that it would be hard to copy from one disk to another.

But, since the machine would have a lot of memory, copying could be done in stages through the memory buffers. A price estimate on the manufacturing cost of such a machine, if done in volume, is shown in Table 2.

Products	Estimate
Black and white monitor	$ 80
One-megabyte floppy disk	250
Letter-quality dot matrix printer	300
Custom keyboard	40
Three single-chip microcomputers	30
256K of RAM	150
ROMs for all software	30
Video interface	20
Disk interface	40
Printer interface	10
Motherboard	40
Power supply	40
Enclosures and cabling	120
Labor (ten hours at $12 per hour)	120
Total:	$1270

Table 2. Estimate for manufacturing cost of a low-end word processor system.

4. Quality speech output produced by digital means will become common in the new systems. Speech input will remain limited.

5. Local networks, which are distributed multiple-microprocessor systems, will become common in some kinds of business applications. In this type of system, every user will have a microcomputer that will look like a terminal with optional floppy disks for local computing. These microcomputers will all be connected, by various types of communications, to a Winchester disk-based intelligent file controller.

Any of the microcomputers will be able to exchange messages with any other, or run common applications

programs, or access common databases by reading and writing on files at the common file controller.

The intelligent file controller will be a fast disk system with an associated microprocessor that controls access to the disks. Its only job is to accept and buffer requests from the distributed microcomputers to read or write parts of files on the disks.

The best systems of this sort will be completely modular in the sense that the number of microcomputers attached to the intelligent file controller can be changed easily. It is also good for the system to be insensitive to the placement of the terminals. That is, the file system should be able to accept requests from a hard-wired microcomputer next to it on the same basis as from a microcomputer at the other end of the city coming in over a communication line. (Datapoint Corp. pioneered the development of this sort of architecture with its ARCNET concept.)

6. Multiple microprocessor systems of various sorts will become common as the controlling elements in complicated machines that require real-time performance, such as aircraft and military hardware.

Present systems of this sort are of the master/slave variety, where a master processor controls a group of slave processors. This type of system is vulnerable if the master is damaged.

The new systems will be different. They will tend to be fault-tolerant because the same function will be spread out and duplicated among a number of microprocessors. If one of them is damaged, or begins executing erroneously, the others will continue to operate and all decisions will be made by majority voting among the microprocessors.

The demand for this type of hardware will spur the creation of distributed operating systems, where each processor has a part of the operating system, and no processor can be singled out as being more important than any other. In other words, the system functions as a committee of interdependent machines.

7. Most new designs for peripherals, such as printers or disks, will incorporate microprocessors. If the peripheral devices have some intelligence, it will be easier for the operating system to control them. Off-loading this burden will be welcome, because operating systems in a multiple processor environment will be complicated enough already.

8. Also in the near future is a new kind of mainframe computer that will consist of a cooperating assembly of closely-coupled microcomputers. Traditional computers that could do multitasking divided the main computer memory into several partitions (for the IBM 370, it's 16 partitions) and installed code belonging to different programs in each of the partitions. The computer then operated by allocating small slices of CPU time to each job on a rotating basis until the jobs were completely executed.

A revolutionary change in architecture will be the viewing of a large, time-sharing computer in the following way: Instead of having the CPU share time between tasks in the main memory, we could have a number of microprocessors working in parallel as part of a "super" computer. When it is time to execute a task, it can be given to any microprocessor that is free. That processor will keep the task and continue to execute on it, without interruption, until it is finished. (Fig. 2 is a representation of this type of set-up.)

Several systems that form minicomputer-like aggregates out of cooperating eight-bit microprocessors recently entered the market. The systems from Action Computer Enterprise, Inc. ("Discovery Multiprocessor"), and from OSM Computer Corp., each use Z-80s on a time-shared common bus for the user processors. One of these companies claims to be able to integrate up to 16 user processors; the other company claims to be able to handle up to 64.

> I wouldn't be surprised to see Intel market a 32-bit machine to give IBM a run for the money in the mainframe market

More Modules

With a mainframe built out of many microprocessors, it should be possible to increment performance over a wide range just by adding more processor modules. This method includes many advantages. If one processor (other than the master) breaks, it will not crash the whole system. Also, this architecture is quite inexpensive compared to current big IBM-type systems of comparable function.

The microprocessor manufacturer who has shown the most interest in multiprocessing has been Intel. All of Intel's newer processors contain features which make it relatively easy to connect them up in cooperating aggregates.

Also, they are currently producing a 32-bit microprocessor, the iAPX-432, for which no clear application exists. Because of the possibilities implicit in this powerful hardware, both alone and in multiprocessor systems, I wouldn't be at all surprised to see Intel establish a mainframe division and market a machine based on multiple iAPX-432s. (It would make sense—Intel has done all the development, so why not reap the profits?) A machine like this would provide tremendous performance and could give IBM a run for the money in the mainframe market.■

The Compleat Atarist

Here's everything you always wanted to know about the Atari's sound effects, including the things that aren't explained in the Basic manual.

By Kent A. Multer

Most popular musical groups include a guitarist, but you'll rarely find an Atarist. An Atarist, obviously, is a person who plays music on an Atari computer.

For those of us who are interested in computer music, the Atari is one of the best deals around. It can play four notes at a time as soon as you take it out of the box; you don't have to spend hundreds of dollars for additional hardware and software. The folks at Atari, with their years of experience in the arcade-game business, are well aware of the value of music and sound effects in computer programs.

Music-Maker

The Atari's sounds are produced by a special integrated circuit called Pokey. It has an impressive variety of features, but many of them are not explained in the Basic manual. Some of them can't be accessed by the sound statement; you have to use pokes.

> The Atari can play four notes at a time as soon as you take it out of the box...

This article will show you how to poke around in Pokey to make any kind of sound that the computer can produce. I've also provided a program that I named, somewhat immodestly, the Universal Sound Generator (USG). It displays the states of all of Pokey's registers, and it allows you to control them with a joystick. (You may want to type in the program now; then you can try out Pokey's functions as you read about them.)

Fig. 1 shows the screen display that USG generates. I have used inverse video characters in some places to improve readability.

To use USG, plug a joystick into port 1. Moving the joystick will move the cursor around on the screen. If you hold down the trigger button while moving the joystick up or down, the number under the cursor will increase or decrease. (Note that you won't hear anything unless at least one of the "volume" numbers is nonzero.)

Pitch Control

Fig. 2 provides a simplified view of Pokey's sound generator. Basically, there are four separate channels, which explains how the Atari can play four notes at a time.

Each channel starts with an eight-bit counter that produces a square wave (which has a bright, distinctive tone, with a sound half-way between a clarinet and a touchtone telephone). The pitch of the sound is controlled by the number in the counter, which you can set from 0 to 255 by doing a poke to the proper address (see Fig. 2). The

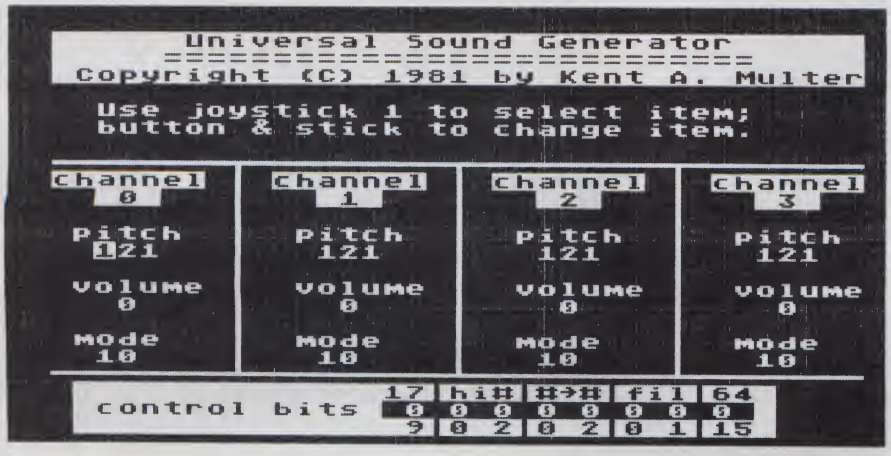


Fig. 1. Screen display of the USG program.

Kent A. Multer, PO Box 732, W. Acton, MA 01720, is a freelance author and programmer.

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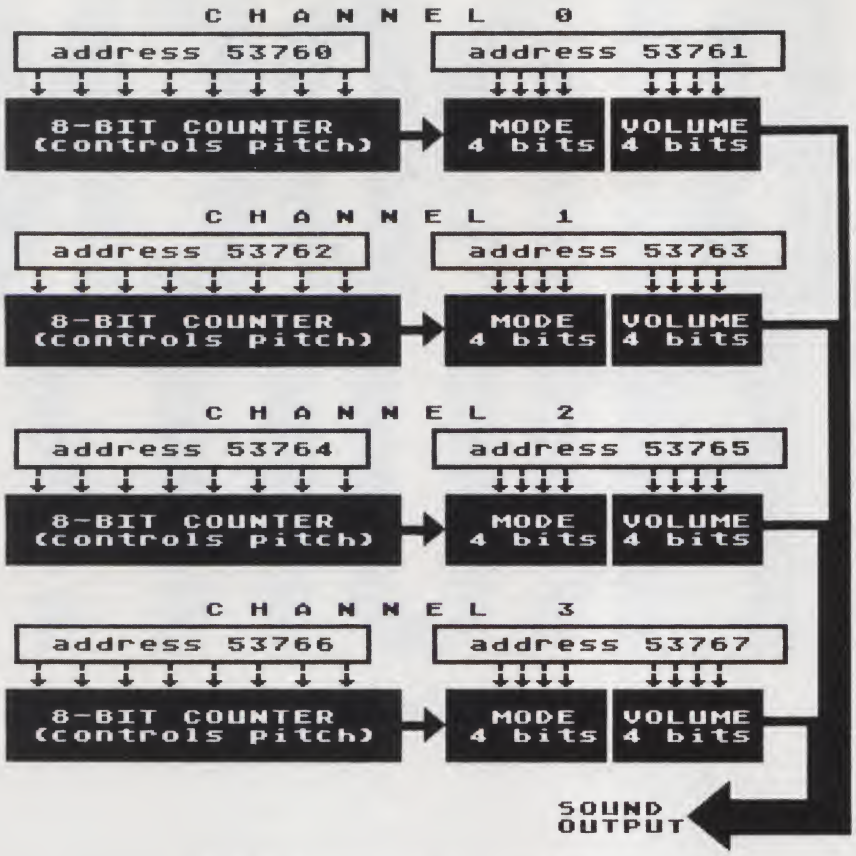


Fig. 2. Block diagram of the Atari's sound generator.

Atari Basic manual gives pitch numbers for a musical scale with a three-octave (37-note) range.

The counters are normally driven by a master clock frequency of 63.9210 kHz. The frequency of the output can be calculated by the following formula:

$$\text{output} = \frac{\text{master freq.}}{2*(\text{counter})}$$

Note that the counter value in this equation is below the divide symbol. This shows that larger numbers in the counter produce lower-pitched sounds. It also means that the higher-pitched notes are spaced farther apart.

For instance, a counter value of 1 produces a note that's twice as high as the note from a counter value of 2. That's a difference of an entire octave; yet, down at the low end of the scale, it's 13 steps from C (243) to C-sharp (230). This is why the musical scale given in the Basic manual stops at high C (29); beyond that, there are only a few pitches that fall on the regular musical scale. Of course, that doesn't mean that the other pitches aren't fun to play around with.

Later, we'll look at ways to get more than three octaves of notes with accurate pitch.

Tone and Volume Control

The square wave from each counter passes through a "distortion," or mode controller, and a volume controller. Then the outputs of the four channels are mixed together and fed to the computer's video section and then to your TV.

The volume and mode controllers each have 16 possible settings, numbered 0 to 15. Both are controlled by one Pokey register, so you can't set one without setting the other at the same time. To do this, take the desired mode number, multiply it by 16 and add the desired volume. Then poke this number to the mode/volume address for the channel, as given in Fig. 2.

To set up channel 0 with a volume "V" and a mode "M", for example, use this statement:

```
POKE 53761, (16*M) +V.
```

The volume is easy to explain: 0 is off, 1 is quiet and 15 is the loudest.

For the 16 modes, the picture is more complicated. First of all, you can forget about the odd numbers, because they lock the channel into something called "volume-only mode." In this mode, the counter is disabled, and the output of the channel is a fixed

voltage that is proportional to the volume.

Theoretically, you could now generate sounds by rapidly changing the volume, effectively using the channel as a D/A converter. In practice, though, you would have to supply several hundred or thousand numbers a second, and Atari Basic isn't that fast. (Assembly language is, though.) So let's go on and look at the even-numbered modes.

Modes 10 and 14 give you the unaltered square wave. In the other modes, the square wave is distorted by combining it with a random or noise signal.

If you want to get a quick impression of how all the different modes sound, try running this short program:

```
10 FOR MODE=0 TO 14 STEP 2:PRINT
   MODE
20 FOR PITCH=0 TO 255:SOUND 0, PITCH,
   MODE,8
30 FOR I=1 TO 20:NEXT I
40 NEXT PITCH:NEXT MODE:END
```

The end statement is included because, on the Atari, it not only stops the program but turns off all sounds as well. Line 30 provides a short time delay so that the separate pitches don't all blur together; you can try leaving that line out to get smooth sweeps of sound. You can also make the time delay longer, so you can more clearly hear the individual notes.

Modes 0 and 8 are the "noisiest"—that is, the most random. Mode 8 has a smooth sound, like the wind or surf. Mode 0 has a deeper, rumbling quality, like thunder or an explosion.

Modes 2, 4, 6, and 12 all produce low-pitched notes with a thin, buzzing tone. These modes are a bit hard to use for music, because they are so low and because there is some variation in sound from one pitch to another. In fact, the same pitch selected several times in a row may have a slightly different sound each time. Also, there are some "phantom" pitch numbers that produce either silence or a high-pitched beep.

In general, these four modes are useful for sound effects such as car engines, laser beams and doorbell buzzers.

Mode 12 has a purer, more musical sound than the others. Table 1 provides some pitch numbers for use in mode 12; they give you an extra octave and a half of bass notes below the regular (mode 10) musical scale. Their slightly raspy quality makes a nice contrast when you play a mode 12 bass line as an accompaniment to a mode 10 melody.

G# (Ab)	245
A	230
A# (Bb)	218
B	203
C	197
C# (Db)	185
D	173
D# (Eb)	161
E	155
F	146
F# (Gb)	137
G	128
G# (Ab)	122
A	116
A# (Bb)	107
B	101

Table 1. Bass note pitch numbers for use in mode 12. The high B in this table is one semitone below the lowest note listed in the Atari Basic manual.

Bit	Poke value	Function
7	128	Decrease randomness of modes 0 and 8.
6	64	Change master frequency of channel 0 to 1.79 MHz.
5	32	Change master frequency of channel 2 to 1.79 MHz.
4	16	Combine channels 0 and 1.
3	8	Combine channels 2 and 3.
2	4	Channel 0 filter on.
1	2	Channel 1 filter on.
0	1	Change 64 kHz master frequency to 15 kHz.

Table 2. Control bit functions.

Control Bits

The Pokey register at location 53768 controls the chip's more exotic functions. The labels on the USG program's screen display may seem cryptic at first, but they will serve to remind you what the bits do (once you have learned their uses).

To turn on a control bit, set it to 1 by doing a poke to location 53768 with the value from Table 2. To turn on

several bits at once, poke 53768 with the sum of the values from the table.

Turning on bit 7 (by setting it to 1) changes one of Pokey's random number generators from 17 bits to nine bits in length. The result is that modes 0 and 8 will sound less "random" and more like modes 2, 4, and 6.

Turning on bit 6 changes the master frequency for the channel 0 counter to 1.78979 MHz. The result is that everything coming from the channel will be much higher in pitch. Bit 5 has the same function for channel 2.

Bits 6 and 5 are mainly intended for use in conjunction with bits 4 and 3. Turning on bit 4 causes the counters of channels 0 and 1 to be linked together into a single 16-bit counter driving channel 1.

Channel 1's counter becomes the coarse tuning control, and channel 0's counter becomes the fine tuning. Turning on control bit 3 links up channels 2 and 3 in the same manner.

A 16-bit counter has the advantages of a wider pitch range and more resolution. With bits 6 and 4 set to 1, we can now tune channel 1's output through the entire audio spectrum. This is how we get the entire musical scale. Table 3 gives coarse and fine tune numbers for a musical scale of 8 octaves.

When linking up two channels, remember to change the master frequency to 1.78979 MHz by setting bit 6 or 5. If you don't do this, the output will be very low in pitch; you may hear just a slight click a few times a second.

Also be sure to turn off the volume

			Counter Value					Counter Value	
Octave	Note	Frequency (Hz)	coarse	fine	Octave	Note	Frequency (Hz)	coarse	fine
0	A	27.5	127	22	4	A	440	7	234
0	A# (Bb)	29.13	119	243	4	A# (Bb)	466.16	7	120
0	B	30.86	113	56	4	B	493.88	7	12
0	C	32.7	106	220	4	C	523.25	6	167
0	C# (Dd)	34.64	100	221	4	C# (Db)	554.36	6	71
0	D	36.7	95	51	4	D	587.32	5	236
0	D# (Eb)	38.89	89	219	4	D# (Eb)	622.25	5	151
0	E	41.2	84	207	4	E	659.25	5	70
0	F	43.65	80	12	4	F	698.45	4	250
0	F# (Gb)	46.24	75	142	4	F# (Gb)	739.98	4	178
0	G	48.99	71	80	4	G	783.99	4	110
0	G# (Ab)	51.91	67	79	4	G# (Ab)	830.6	4	46
1	A	55	63	135	5	A	880	3	241
1	A# (Bb)	58.27	59	246	5	A# (Bb)	932.32	3	184
1	B	61.73	56	152	5	B	987.76	3	130
1	C	65.4	53	106	5	C	1046.5	3	80
1	C# (Db)	69.29	50	107	5	C# (Db)	1108.73	3	32
1	D	73.41	47	150	5	D	1174.65	2	242
1	D# (Eb)	77.78	44	234	5	D# (Eb)	1244.5	2	200
1	E	82.4	42	100	5	E	1318.51	2	159
1	F	87.3	40	2	5	F	1396.91	2	121
1	F# (Gb)	92.49	37	195	5	F# (Gb)	1479.97	2	85
1	G	97.99	35	164	5	G	1567.98	2	51
1	G# (Ab)	103.82	33	164	5	G# (Ab)	1661.21	2	19
2	A	110	31	192	6	A	1760	1	245
2	A# (Bb)	116.54	29	247	6	A# (Bb)	1864.65	1	216
2	B	123.47	28	72	6	B	1975.53	1	189
2	C	130.81	26	177	6	C	2093	1	164
2	C# (Db)	138.59	25	50	6	C# (Db)	2217.46	1	140
2	D	146.83	23	199	6	D	2349.31	1	117
2	D# (Eb)	155.56	22	113	6	D# (Eb)	2489.01	1	96
2	E	164.81	21	46	6	E	2637.02	1	76
2	F	174.61	19	253	6	F	2793.82	1	57
2	F# (Gb)	184.99	18	222	6	F# (Gb)	2959.95	1	39
2	G	195.99	17	206	6	G	3135.96	1	22
2	G# (Ab)	207.65	16	206	6	G# (Ab)	3322.43	1	6
3	A	220	15	220	7	A	3520	0	247
3	A# (Bb)	233.08	14	248	7	A# (Bb)	3729.31	0	232
3	B	246.94	14	32	7	B	3951.06	0	219
3	C	261.62	13	85	7	C	4186	0	206
3	C# (Db)	277.18	12	149	7	C# (Db)	4434.92	0	194
3	D	293.66	11	224	7	D	4698.63	0	183
3	D# (Eb)	311.12	11	53	7	D# (Eb)	4978.03	0	172
3	E	329.62	10	147	7	E	5274.04	0	162
3	F	349.22	9	251	7	F	5587.65	0	153
3	F# (Gb)	369.99	9	107	7	F# (Gb)	5919.91	0	144
3	G	391.99	8	227	7	G	6271.92	0	135
3	G# (Ab)	415.3	8	99	7	G# (Ab)	6644.87	0	127

Table 3. Coarse and fine tune numbers to produce the entire musical scale by combining two sound channels.

```
10000 REM ================  Initialization  ============================
10001 REM
10005 GRAPHICS 0:PRINT
10010 PRINT "      Universal Sound Generator      "
10012 PRINT "     ==========================     "
10015 PRINT "                                    "
10017 PRINT :PRINT "  Use joystick 1 to select item;"
10018 PRINT "  button & stick to change item."
10020 POSITION 2,9:PRINT "channel   channel   channel   channel"
10025 POSITION 2,10:PRINT "   0         1         2         3 "
10030 POSITION 2,12:PRINT " pitch     pitch     pitch     pitch"
10040 POSITION 2,15:PRINT " volume    volume    volume    volume"
10050 POSITION 2,18:PRINT " mode      mode      mode      mode"
10052 POSITION 2,21:PRINT "                  17;hi#;#";CHR$(27);CHR$(159);"#;fil;64
 ";
10055 POSITION 2,22:PRINT "  control bits  0 0 0 0 0 0 0 0  ";
10057 POSITION 2,23:PRINT "                 9;0 2;0 2;0 1;15 ";
10060 FOR X=2 TO 38:FOR Y=8 TO 20 STEP 12:POSITION X,Y:PRINT CHR$(18);:NEXT Y:NE
XT X
10070 FOR X=10 TO 30 STEP 10:POSITION X,8:PRINT CHR$(23);:POSITION X,20:PRINT CH
R$(24);:NEXT X
10078 FOR Y=9 TO 19:FOR X=10 TO 30 STEP 10
10080 POSITION X,Y:PRINT "!";:NEXT X:NEXT Y
10100 FOR I=0 TO 3:SOUND I,121,10,0:NEXT I
11000 DIM X(7,3),Y(7,3):FOR X=0 TO 7:FOR Y=0 TO 3:READ N:X(X,Y)=N:READ N:Y(X,Y)=
N:NEXT Y:NEXT X
11010 DATA 4,13,5,16,4,19,18,22
11015 DATA 14,13,15,16,14,19,20,22
11020 DATA 24,13,25,16,24,19,22,22
11025 DATA 34,13,35,16,34,19,24,22
11030 DATA -1,-1,-1,-1,-1,-1,26,22
11035 DATA -1,-1,-1,-1,-1,-1,28,22
11040 DATA -1,-1,-1,-1,-1,-1,30,22
11045 DATA -1,-1,-1,-1,-1,-1,32,22
11200 DIM ITEM(3,2):DIM BIT(7)
11210 FOR I=0 TO 3:ITEM(I,0)=121:ITEM(I,1)=0:ITEM(I,2)=10:NEXT I
11220 FOR I=0 TO 7:BIT(I)=0:NEXT I
11500 FOR X=0 TO 3:FOR Y=0 TO 2:POSITION X(X,Y),Y(X,Y):PRINT ITEM(X,Y);" ";:NEXT
 Y:NEXT X
11600 X=0:Y=0:POSITION X(0,0)-1,Y(0,0):PRINT " ";
11880 REM
11890 REM
11900 REM ================  Cursor movement  ==========================
11910 REM
12000 FOR I=1 TO 15:NEXT I
12005 S=STICK(0):IF STRIG(0)=0 THEN 14000
12007 IF S=15 THEN 12000
12010 IF S<>7 THEN 12100
12020 X=X+1:IF X>7 THEN X=0
12025 IF X(X,Y)=-1 THEN X=0
12030 GOTO 13000
12100 IF S<>14 THEN 12200
12110 Y=Y-1:IF Y<0 THEN Y=3
12115 IF X(X,Y)=-1 THEN X=3
12120 GOTO 13000
12200 IF S<>11 THEN 12300
12210 X=X-1:IF X<0 THEN X=7
12215 IF Y(X,Y)=-1 THEN X=3
12220 GOTO 13000
12300 IF S<>13 THEN 12000
12310 Y=Y+1:IF Y>3 THEN Y=0:IF X(X,Y)=-1 THEN X=3
12990 REM
12992 REM
12994 REM ================  Print new value  ============================
12996 REM
13000 POSITION X(X,Y),Y(X,Y)
13010 IF Y<3 THEN PRINT ITEM(X,Y);" ";
13020 IF Y=3 THEN PRINT BIT(X);
13030 POSITION X(X,Y)-1,Y(X,Y):PRINT " ";
13040 GOTO 12000
13990 REM
13992 REM
13994 REM ================  Change value  ============================
13996 REM
14000 IF (S<>14) AND (S<>13) THEN 12000
14005 IF Y=3 THEN 15000
14010 IF S=14 THEN DELTA=1:GOTO 14020
14015 DELTA=-1:IF S<>13 THEN 12000
14020 ON Y GOTO 14100,14200
14050 I=ITEM(X,Y)+DELTA:IF I<0 OR I>255 THEN 12000
14060 ITEM(X,Y)=I:GOTO 14500
14100 I=ITEM(X,Y)+DELTA:IF I<0 OR I>15 THEN 12000
14110 ITEM(X,Y)=I:GOTO 14500
14200 I=ITEM(X,Y)+2*DELTA:IF I<0 OR I>14 THEN 12000
14210 ITEM(X,Y)=I
14500 POKE 53760+2*X,ITEM(X,0):POKE 53761+2*X,ITEM(X,2)*16+ITEM(X,1)
14510 GOTO 13000
15000 BIT(X)= NOT BIT(X):J=0
15010 FOR I=0 TO 7:J=J*2+BIT(I):NEXT I
15020 POKE 53768,J
15100 GOTO 13000
```

Listing 1. Universal Sound Generator program.

This program is available on disk or cassette for $10 from Magic Metal Productions, PO Box 732, W. Acton, MA 01720.

for the fine tune channel (0 or 2). Otherwise, it will produce a tone whose pitch is unrelated to what you're trying to create.

Bits 2 and 1 activate something that Atari's technical manuals describe as a "high-pass" filter. To me it sounds more like a balanced modulator, but let's not quibble over words. The important fact is that it makes some great spacey sounds.

The filter takes input from two channels, and produces an output whose perceived pitch has components of both input signals. Control bit 2 inserts a filter into channel 0, with the other driving signal being taken from channel 2. Control bit 1 does a corresponding action with channels 1 and 3. (The outputs of channels 2 and 3 are not affected by turning on the filters.)

The sound that the filters make is a bit hard to describe, so I suggest you just give it a try. Switch on control bit 2 and listen to channel 0 while changing the pitch of channel 0 and/or 2. This effect is good for bell-like tones as well as science-fiction type sound effects.

Turning on control bit 0 switches the regular 63.9210 kHz master frequency to 15.6999 kHz. The result is that all channels drop about two octaves in pitch. This will not affect any channels that have been switched to a 1.78979 MHz master frequency by the other control bits.

Gotchas and Glitches

There are a few technical points that you will need to know in order to use Pokey's advanced features. For one thing, all the registers are "write-only." That means that you can use Poke to put things into them, but you can't use Peek to find out what's there. So you may need to do what the USG program does: store their values in an array, and update the array whenever you change one of the registers.

In order to keep the price of the computer low, the folks at Atari have used Pokey's counters to provide timing signals for all I/O devices (except the keyboard and display). That's why you hear all those clicks and beeps when you use a disk, printer or tape cassette; you're actually listening to the commands and data traveling on the bus. The only problem with this is that you generally can't generate sounds if you're doing I/O at the same time. A smart programmer, armed with Atari's technical manuals, can do

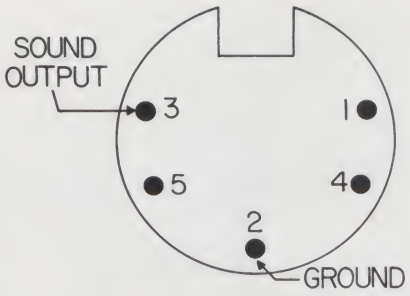


Fig. 3. Pin layout of the Atari's video connector.

it to an extent, but some of Pokey's channels will not be available to make sounds.

When doing I/O, the computer's operating system may play around with the control bits. In order to prevent this from messing up your programs, the sound statement always sets all the control bits to 0. This means that if you want to experiment with the control bits, you'll have to forego using the sound statement and do everything with Pokes.

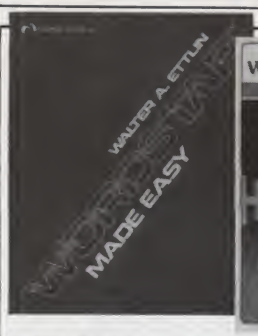
Although any channel can have its volume set as loud as 15, you should make sure that the total of the volume numbers for all four channels does not exceed 32. If it does, the signal will be quite distorted. Then again, you might like that sound: heavy metal computer music, anyone?

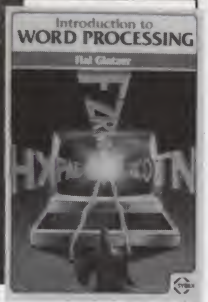
External Hookups

As soon as you power up your machine, you can listen to Pokey through the speaker on your TV. If you want a higher-quality signal, you can buy or make a cord to go from the computer's monitor jack to your hi-fi. This jack is intended mainly for connection to a video monitor, but the sound signal is available on pin 3 (see Fig. 3). In case you want to make your own cord, the connector you need is called a five-pin D.I.N. plug (male), which you can get at most radio stores.

I highly recommend that you try this. The computer puts out a clean line level signal, free of the hum and hiss that your TV probably adds. When played through a good stereo or instrument amp, the Atari can really cut loose with anything from a Bach fugue to an exploding asteroid. It sounds so nice, it just might inspire you to become a virtuoso Atarist.■

Special Interests





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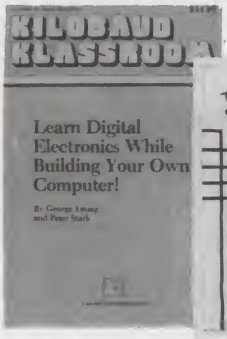

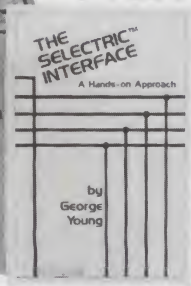

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THE CUSTOM APPLE AND OTHER MYSTERIES—by Winifred Hofacker and Ekkehard Floegel. This is *the* guide to customizing Apple software and hardware, published by the folks at IJ6. It contains such hands on information such as: data acquisition and control applications, Programming the 6522 Internal timer, Constructing the 6522 I/O board, An Eprom Burner for the Apple Computer, An Eprom/RAM board, The Apple Slot Repeater, and much, much more. BK1246 $24.95.

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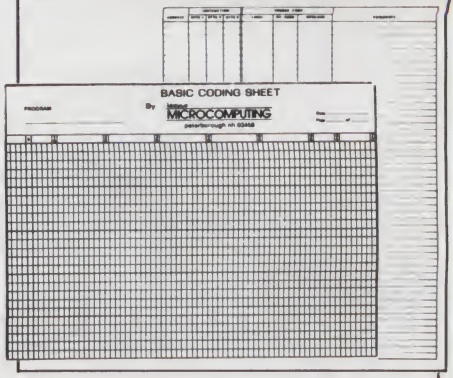

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LEARNING TRS-80 BASIC–by David A. Lien. Dr. Lien, who is the author of THE BASIC HANDBOOK and the original Radio Shack LEVEL I USER'S MANUAL, has compiled a tutorial which includes portions of the original USER'S MANUAL, and most of LEARNING LEVEL II along with extensive additions. It will completely cover the TRS-80 Models I, II, III, and 16 (sorry, not the color or pocket computers). It is, of course, written in the easy learning style which readers of Dr. Lien's books have come to enjoy. BK1175 $19.95.

THE BASIC HANDBOOK—SECOND EDITION—by David Lien. This book is unique. It is a virtual ENCYCLOPEDIA of BASIC. While not favoring one computer over another, it explains over 250 BASIC words, how to use them and alternate strategies. If a computer does not possess the capabilities of a needed or specified word, there are often ways to accomplish the same function by using another word or combination of words. That's where the HANDBOOK comes in. It helps you get the most from your computer, be it a "bottom-of-the-line" micro or an oversized monster. BK1174 $19.95.*

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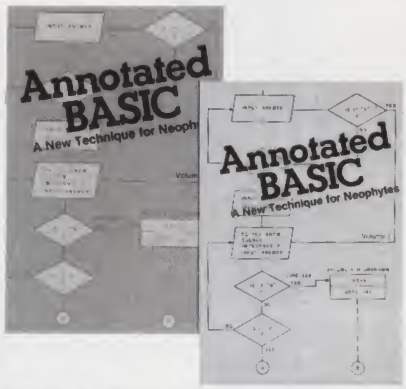

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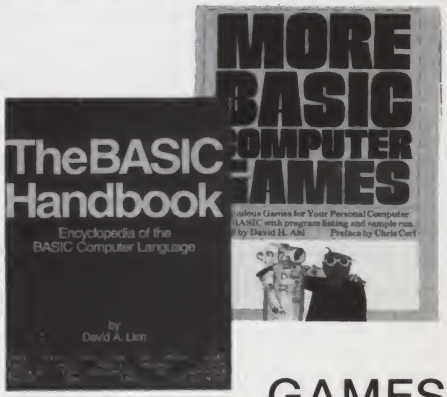

GAMES

CAPTAIN 80 BOOK OF BASIC ADVENTURES—by Robert Liddil. This book contains 18 of the most popular Adventure programs available today; all in one easy to read book with listings ready to be keyed in to your computer. This unique book also contains an ADVENTURE GENERATOR program, not available from any other source. This generator program will actually write another BASIC ADVENTURE PROGRAM! Although specifically written for the TRS-80 Model I & III, these programs are adaptable to other computers using Microsoft BASIC. BK 1240 $19.95.

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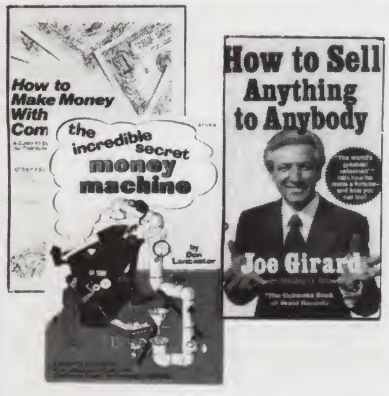
Money making



HOW TO MAKE MONEY WITH COMPUTERS—In 10 information-packed chapters, Jerry Felsen describes more than 30 computer-related, money-making, high profit, low capital investment opportunities. BK1003 $15.00.*

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A Worldwide PET Interface

Hook up your PET to the world with this digital-voltmeter interface, which lets you monitor and record readings from outside devices.

By R. Lynn Witmer

This simple, inexpensive interface lets me use my PET microcomputer to monitor and record readings from a digital voltmeter. The total cost of interface parts is about $5.

A microcomputer's usefulness can be greatly enhanced by interfacing it with any of the thousands of instruments that are available today. These instruments range from common off-the-shelf devices like thermometers to custom-made gadgets such as pressure gauges on gas cells for nuclear reaction analysis. In the past ten years, digital electronic outputs have become common on many instruments; microcomputers can read and control these directly, without signal conversion.

If an instrument's digital output is visual, via a liquid crystal display (LCD) or light emitting diode (LED), a person could record the output—alleviating the need for a computer. But there are several good reasons for letting a microcomputer perform this task:

1. No people are necessary. The computer can record values for long periods of time and store them in memory or on disk or tape.

2. Several devices can be read simultaneously. If two or more instruments are interfaced to the computer, it is often desirable to know the display of each at a given instant.

3. One instrument can be read continuously with very little time between readings, a needed feature, since sometimes the quantity being measured changes rapidly. The limiting factor is usually the instrument rather than the computer.

4. Automatic feedback is possible. The microcomputer can electronically adjust a system based on some quantity it has just read.

Fig. 1. PET-DVM relationship.

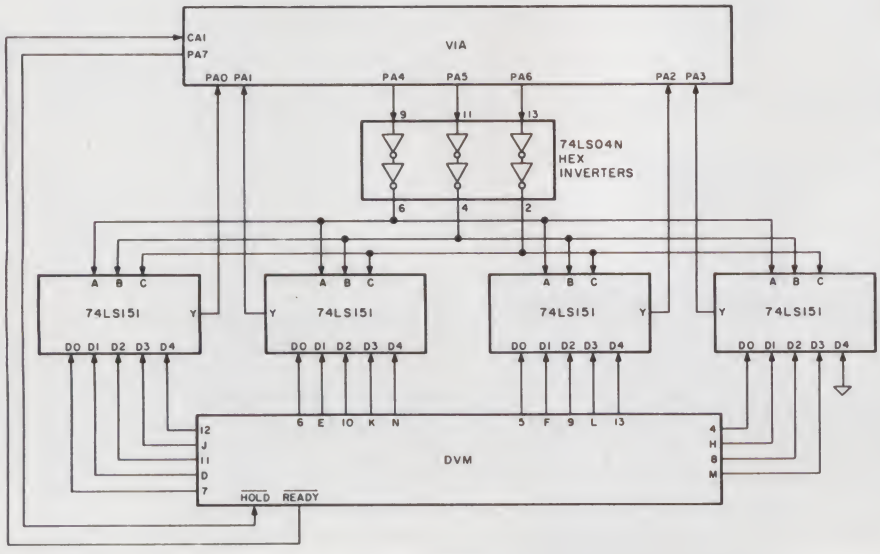

Fig. 2. PET-DVM interface circuit.

General-Purpose Interface Bus

For a microcomputer to read some device's output, they must communicate. One standard interface has become popular in the past few years: the IEEE-488 General-Purpose Interface Bus (GPIB). Many devices are designed for it and it's easy to use. Cost is its drawback. Having the added convenience of GPIB compatibility can double the cost of some instruments. For example, a Hewlett-Packard 3½-digit multimeter costs $1010 with and $460 without GPIB connections.

For signals to be transmitted through an interface between "listeners" and "talkers," some device must

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act as the controller. PET and Apple microcomputers can act as a controller in addition to listening or talking. PETs are GPIB compatible as well.

Despite the advantages, many instruments do not have GPIB interface capability due to cost. To read such devices, a microcomputer needs some other interface.

PET-DVM Interface

The voltmeter I used is a 4½-digit Newport 2003A digital panel voltmeter. Its full-scale voltage is ±199.99 mV with an uncertainty of ±10 uV. This maximum voltage can be varied by changing internal resistors. The meter has four digits which can display any numeral. The ½ digit displays a – for negative voltages and a 1 for potential differences between ±100 and 200 mV.

The voltage is also output at the meter's back on pins in parallel binary coded decimal (BCD). The DVM talks and listens to the PET through the interface via these pins. (See Fig. 1.)

The PET also communicates via pins on its board. Parallel user port pins protrude from the back of the PET and are connected to the interface. Inside the PET these pins are linked directly to a 6522 Versatile Interface Adapter (VIA). Eight bidirectional input/output lines (PA0–PA7) and two input handshake lines (CA1 and CB2) are available for programming on the VIA. All remaining pins on the VIA are dedicated to other purposes in the PET. The VIA pins used in the PET-DVM interface are shown in Fig. 2.

The heart of the interface lies in the four SN74LS151 multiplexor chips seen in Fig. 2. These multiplexors have eight data input lines (D0–D7). Depending on the select inputs (A,B,C), the value on one of the eight input lines will be output on Y. The PET controls these select inputs. Table 1 shows which output is on Y for the various combinations.

Four bits (base 2) are required to convey the information of one BCD digit (base 10), so four multiplexors are needed in the interface. Each bit of one BCD digit is connected to a different multiplexor. All D0 inputs are from the least-significant digit (LSD); D1 inputs come from the second significant digit (2SD), and so on, as outlined in Table 2.

The same select input combination is placed on each multiplexor by the PET, since all A inputs, all B inputs and all C inputs are connected (see Fig. 2). Thus, the four inputs to the PET's VIA (PA0–PA3) correspond to one BCD digit at any given time. By stepping through the various input select combinations of Table 1, the PET can read and store the DVM display one digit at a time.

> Despite the advantages, many instruments do not have the GPIB capability due to the cost.

The first four inputs (D0,D1,D2,D3) of each multiplexor correspond to the LSD, 2SD, 3SD, and MSD of the DVM, respectively. The D4 input is used differently. D4 of the first multiplexor tells whether the voltage is between ±100 and 200 mV. The sign of the display is given on D4 of multiplexor 2. This input signals an overload (voltage in excess of 200 mV) on the third multiplexor. The last D4 is not used, so it is grounded.

None of the D5, D6 or D7 multiplexor inputs are needed to read a 4½-digit DVM, but they allow expansion to an eight-digit DVM if desired. Sixteen input multiplexors, such as SN74150, are available, which would allow a 16-digit device to be read.

The PET sets the select inputs A, B and C through its VIA outputs PA4, PA5 and PA6. However, these outputs are not capable of driving the inputs of four multiplexors, so I sent each VIA output through an inverter which can supply the current needed to set inputs of all four multiplexors.

Select Inputs			Y Output
A	B	C	
0	0	0	D0
1	0	0	D1
0	1	0	D2
1	1	0	D3
0	0	1	D4
1	0	1	D5
0	1	1	D6
1	1	1	D7

Table 1. Function table for SN74LS151 multiplexor.

In actuality, each VIA output is inverted twice, to get the original signal back.

Two lines run directly between the VIA and DVM. The $\overline{\text{HOLD}}$ is controlled by the VIA and tells the DVM to maintain its display when this line is 0. The DVM then tells the PET its output can be read by setting the $\overline{\text{READ}}$ line to 0. I determined with an oscilloscope that the DVM data is not ready ($\overline{\text{READY}}=1$) for up to 38 ms after it has been told to hold. By waiting 38 ms after sending a hold signal ($\overline{\text{HOLD}}=0$), I am assured the data is then valid. Therefore, a $\overline{\text{READY}}$ line is not needed, but I retained it for future flexibility.

Fig. 3 gives the timing sequence. Thus, four 74LS151 multiplexors, one 74LS04N hex inverter and a $\overline{\text{HOLD}}$ line are necessary for a PET-DVM interface. I used a 7805 voltage regulator to supply the necessary +5 V across each chip. The 7805 is supplied with +10 V from internal PET pins, but any 7 to 18 V supply can be used.

Programming

The PET writes the multiplexor select inputs and reads their outputs through its VIA. With PETs, the VIA can be controlled by either a Basic or

DVM Pin	Function	Digit	Multiplexor Input
4	8 bit		
5	4 bit	LSD	D0
6	2 bit		
7	1 bit		
8	800 bit		
9	400 bit	3SD	D2
10	200 bit		
11	100 bit		
12	10K bit	1/2	D4
13	overload		
D	10 bit		
E	20 bit	2SD	D1
F	40 bit		
H	80 bit		
J	1K bit		
K	2K bit	MSD	D3
L	4K bit		
M	8K bit		
N	+polarity	1/2	D4
P	READY	–	–
R	HOLD	–	–

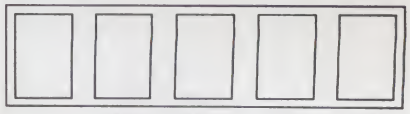

Table 2. DVM assignments.

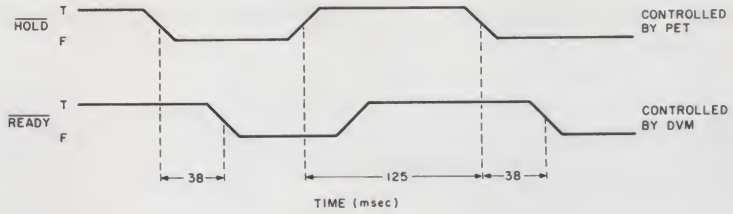

Fig. 3. Timing diagram.

```
5 REM THIS PROGRAM ENABLES THE PET TO READ A DIGITAL VOLTMETER
6 :
13 POKE 59459,240:REM SET UP DATA DIRECTION REGISTER
15 X=59457
16 POKEX,0          :REM HOLD DISPLAY
17 FORJ=1TO30:NEXT:REM WAIT 38 MILLISEC FOR DISPLAY HOLD
18 REM LINES 20-50 READ EACH DIGIT
19 :
20 FORI=0TO4
30 POKE X,I*16
40 A(I)=PEEK(X)-I*16
50 NEXT I
60 VOLT=A(0)*.01+A(1)*.1+A(2)+A(3)*10
64 :
65 REM LINES 70-110 DETERMINE IF THE POTENTIAL IS GREATER THAN
66 REM 200 MILLIVOLTS, IS 100-200 MILLIVOLTS, OR IS NEGATIVE
68 :
70 IF A(4)<3.5 THEN GO TO 100
80 PRINT "VOLTAGE IN EXCESS OF 200 MILLIVOLTS."
90 GO TO 125
100 IF A(4)=1 OR A(4)=3 THEN VOLT=VOLT+100
110 IF A(4)<1.5 THEN VOLT=-VOLT
120 PRINT "THE VOLTMETER READS";VOLT;"MILLIVOLTS."
125 PRINT
130 POKE X,128      :REM ALLOW DISPLAY CHANGE
135 FORJ=1TO85:NEXT:REM WAIT 125 MILLISEC FOR DISPLAY CHANGE
140 GOTO16
```

Program listing. Basic program to control the PET's VIA.

machine-language program. Basic is easiest to use and will suffice unless speed is paramount.

Initially, the VIA must be told which of its eight I/O lines will be used for input and which for output. You do this through the data direction register (DDR) in memory location 59459. In the DDR, bit 0 controls PA0, bit 1 controls PA1, and so on. A 1 in the corresponding DDR bit means that line is for output, a 0 means input. Since PA7-PA4 are outputs and PA3-PA0 are inputs, the DDR should be set to 1111 0000 (base 2) or 240 (base 10). Statement 13 of the program does this. (See the program listing.)

The VIA outputs are controlled with the output register in memory location 59457. Poke 59457,0 sets all outputs to 0. In other words, $\overline{\text{HOLD}}$ and all the multiplexor select inputs equal zero, putting the D0 value on Y. The value of the LSD is then read and stored by the PET with a Peek command. The other DVM digits are examined by stepping through the A, B and C select input combinations by changing the output register contents. I do this in the For-Next loop of the program (lines 20–50).

Once each DVM digit has been stored, the voltage is calculated in millivolts. Information from the ½ digit is also processed and the entire DVM display is printed on the PET's CRT. The voltmeter is now allowed to update its display ($\overline{\text{HOLD}}$ = 1) and is given 125 ms to do so. (See Fig. 3.) Thus the PET has read the DVM. At this point the value can be used in some calculation or for feedback, or it can be recorded permanently on disk or tape.■

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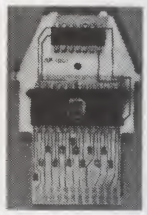

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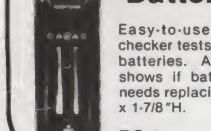

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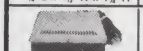

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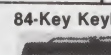

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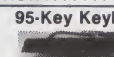

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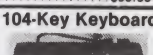

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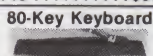

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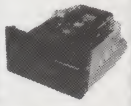
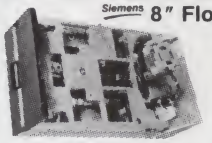
5¼" Mini-Floppy Disk Drive
FOR TRS-80 MODEL I (Industry Standard)
Features single or double density. Recording mode: FM single, MFM double density. Power: +12VDC (±0.6V) 1.6A max., +5VDC (±0.25V) 0.6A max. Unit as pic. at left (does not incl. case, power supply, cables). 30 pg. data book incl. Wt. 3½ lbs. Size: 5¾"W x 8"D x 3¼"H.

Pertec Computer Corp.



Part No.	Limited Quantity!	Price
FD200	Single-sided, 40 tracks, 250K bytes capacity	$179.95
FD250	Double-sided, 35 tracks, 438K bytes capacity	$199.95

Siemens 8" Floppy Disk Drive



- Shugart 801R compatible
- Single-Sided
- 77 Tracks
- 400/800K Bytes Capacity
- Industry Standard

The **FDD100-8 8" Floppy Disk Drive** (industry Standard) features single or double density. Recording mode: FM single, MFM double density. Transfer rate: 250K bits/sec. single density; 500K bits/sec. double density. The FDD100-8 is designed to work with the single-sided soft sectored IBM Diskette I, or eq. disk cartridge. Hard-sectored option available. Power: 115/230VAC @ 50-60Hz, +24VDC @ 1.7 amps max., +5VDC @ 1.2 amps max. Unit as pictured above (does not include case, power supply, or cables). Size: 8.55"W x 14"L x 4.5"H. Weighs 12 lbs. Incl. 96-pg. manual.

Part No.		Price
FDD100-8	Buy 1 for	$269.95 each
FDD100-8	Buy 2 for	$259.95 each
FDD100-8	*Buy 10 for*	*$249.95 each*

2708,2716,2732 & 2764 EPROM Programmer
JE664 EPROM PROGRAMMER
8K TO 64K EPROMS — 24 AND 28 PIN PACKAGES
Self-Contained — Requires No Additional Systems for Operation

NEW!

• Programs, validates, and checks for properly erased EPROMs • Emulates PROMs or EPROMs • RS232C Computer Interface for editing/program loading • Loads data into RAM by keyboard • Changes data in RAM by keyboard • Loads RAM from an EPROM • Compares EPROMs for content differences • Copies EPROMs • Power input: 115VAC, 60Hz, ◄ 10W power consumption • Enclosure: Color-coordinated, light tan panels w/molded mocha brown end pieces • Size: 15-5/8"L x 8¾"D x 3⅞"H • Wt.: 5¾ lbs.

JE664-A EPROM Programmer $995.00
Assembled & Tested (Includes JM16A Module)

JE665 — RS232C INTERFACE OPTION — The JE665 RS232C Interface Option implements computer access to the JE664's RAM. Sample software written in BASIC provided for TRS-80® Model I, Level II Computer. Baud rate: 9600. Word Lgth: 8 bits - odd parity. Stop bits: 2. Option may be adapted to other computers

JE664-ARS EPROM Prog. w/JE665 Option $1195.00
Assembled and Tested (Includes JM16A Module)

EPROM JUMPER MODULES — The JE664's JUMPER MODULE (Personality Module) is a plug-in Module that pre-sets JE664 for proper programming pulses to the EPROM & configures EPROM socket connections for that particular EPROM

Part No.	EPROM	EPROM MANUFACTURER	PRICE
JM08A	2708	AMD, Motorola, National, Intel, TI	$14.95
JM16A	2716,TMS2516	Intel, Motorola, National, NEC, TI	$14.95
JM16B	TMS2716	Motorola, TI (+5,-12, +12)	$14.95
JM32A	TMS2532	Motorola, TI	$14.95
JM32B	2732	AMD, Fujitsu, NEC, Hitachi, Intel	$14.95
JM64A	MCM68764, MCM68L764	Motorola	$14.95
JM64B	2764	Intel	$14.95
JM64C	TMS2564	TI	$14.95

UV-EPROM Eraser

8 Chips — 51 Minutes

1 Chip — 37 Minutes

Erases 2708, 2716, 2732, 2764, 2516, 2532, 2564. Erases up to 8 chips within 51 minutes (1 chip in 37 minutes). Maintains constant exposure distance of one inch. Special conductive foam liner eliminates static build-up. Built-in safety lock to prevent UV exposure. Compact — only 9.00"x3.70"x2.60". Complete with holding tray for 8 chips.

UVS-11EL Replacement Bulb $16.95
DE-4 UV-EPROM Eraser $79.95

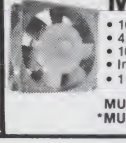
Sprite-style Fan

- 36cfm free air delivery
- 3.125" sq. x 1.665" depth
- 10 yrs. cont. duty at 20°C
- 115V 50/60Hz

*Metal Frame

PWS2107U Cleaned & tested (used) . . . . $ 9.95 ea.
***PWS2107F** New . . . . . $14.95 ea.

Muffin-style Fan



- 105cfm free air delivery
- 4.68" sq. x 1.50" depth
- 10 yrs. cont. duty at 20°C
- Impedance protected, ambients to 70°C
- 115V 50/60Hz 14W Wt. 17 oz.

*Metal Frame

MU2A1-U Cleaned & tested (used) . . . . $9.95 ea.
***MU2A-1N** New . . . . . $14.95 ea.

Circle 41 on Reader Service card.

4164 64K DYNAMIC 200 NS $6.25

TMM2016 2KX8 STATIC 200 NS $41

ALL MERCHANDISE 100% GUARANTEED!

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STATIC RAMS

2101	256 x 4 (450ns)	1.95
5101	256 x 4 (450ns) (cmos)	3.95
2102-1	1024 x 1 (450ns)	.89
2102L-4	1024 x 1 (450ns) (LP)	1.29
2102L-2	1024 x 1 (250ns) (LP)	1.69
2111	256 x 4 (450ns)	2.99
2112	256 x 4 (450ns)	2.99
2114	1024 x 4 (450ns)	8/14.95
2114L-4	1024 x 4 (450ns) (LP)	8/15.25
2114L-3	1024 x 4 (300ns) (LP)	8/15.45
2114L-2	1024 x 4 (200ns) (LP)	8/15.95
2147	4096 x 1 (55ns)	4.95
TMS4044-4	4096 x 1 (450ns)	3.49
TMS4044-3	4096 x 1 (300ns)	3.99
TMS4044-2	4096 x 1 (200ns)	4.49
MK4118	1024 x 8 (250ns)	9.95
TMM2016-200	2048 x 8 (200ns)	4.15
TMM2016-150	2048 x 8 (150ns)	4.95
TMM2016-100	2048 x 8 (100ns)	6.15
HM6116-4	2048 x 8 (200ns) (cmos)	4.95
HM6116-3	2048 x 8 (150ns) (cmos)	5.95
HM6116-2	2048 x 8 (120ns) (cmos)	8.95
HM6116LP-4	2048 x 8 (200ns) (cmos)(LP)	6.95
HM6116LP-3	2048 x 8 (150ns) (cmos)(LP)	8.95
HM6116LP-2	2048 x 8 (120ns) (cmos)(LP)	10.95
Z-6132	4096 x 8 (300ns) (Qstat)	34.95

LP = Low Power Qstat = Quasi-Static

DYNAMIC RAMS

TMS4027	4096 x 1 (250ns)	1.99
UPD411	4096 x 1 (300ns)	3.00
MM5280	4096 x 1 (300ns)	3.00
MK4108	8192 x 1 (200ns)	1.95
MM5298	8192 x 1 (250ns)	1.85
4116-300	16384 x 1 (300ns)	8/11.75
4116-250	16384 x 1 (250ns)	8/11.95
4116-200	16384 x 1 (200ns)	8/13.95
4116-150	16384 x 1 (150ns)	8/15.95
4116-120	16384 x 1 (120ns)	8/29.95
2118	16384 x 1 (150ns) (5v)	4.95
4164-200	65536 x 1 (200ns) (5v)	6.25
4164-150	65536 x 1 (150ns) (5v)	7.25

5V = single 5 volt supply

EPROMS

1702	256 x 8 (1us)	4.50
2708	1024 x 8 (450ns)	3.95
2758	1024 x 8 (450ns)(5v)	5.95
2716	2048 x 8 (450ns)(5v)	3.95
2716-1	2048 x 8 (350ns)(5v)	6.25
TMS2516	2048 x 8 (450ns)(5v)	5.50
TMS2716	2048 x 8 (450ns)	7.95
TMS2532	4096 x 8 (450ns)(5v)	7.95
2732	4096 x 8 (450ns)(5v)	4.95
2732-250	4096 x 8 (250ns)(5v)	12.95
2732-200	4096 x 8 (200ns)(5v)	16.95
2764	8192 x 8 (450ns)(5v)	16.95
2764-250	8192 x 8 (250ns)(5v)	18.95
2764-200	8192 x 8 (200ns)(5v)	24.95
TMS2564	8192 x 8 (450ns)(5v)	24.95
MC68764	8192 x 8 (450ns)(5v)(24 pin)	39.95

5v = Single 5 Volt Supply

EPROM ERASERS

	Timer	Capacity Chip	Intensity (uW/Cm²)	
PE-14		6	5,200	83.00
PE-14T	X	6	5,200	119.00
PE-24T	X	9	6,700	175.00
PL-265T	X	20	6,700	255.00
PR-125T	X	16	15,000	349.00
PR-320	X	32	15,000	595.00

DISC CONTROLLERS

1771	16.95
1791	29.95
1793	38.95
1795	54.95
1797	54.95
6843	34.95
8272	39.95
UPD765	39.95
1691	18.95
2143	18.95

INTERFACE

8T26	1.69
8T28	2.49
8T95	.99
8T96	.99
8T97	.99
8T98	.99
DM8131	2.95
DP8304	2.29
DS8835	1.99
DS8836	.99

MISC.

3242	7.95
3341	4.95
MC3470	4.95
MC3480	9.00
11C90	13.95
95H90	7.95
2513-001 UP	9.95
2513-002 LOW	9.95

SOUND CHIPS

76477	3.95
76489	8.95
AY3-8910	12.95
MC3340	1.49

CRT CONTROLLERS

6845	14.95
68B45	35.95
HD46505SP	15.95
6847	12.25
MC1372	6.95
68047	24.95
8275	29.95
7220	99.95
CRT5027	39.95
CRT5037	49.95
TMS9918A	39.95
DP8350	49.95

BIT-RATE GENERATORS

MC14411	11.95
BR1941	11.95
4702	12.95
COM5016	16.95
COM8116	10.95
MM5307	10.95

UARTS

AY3-1014	6.95
AY5-1013	3.95
AY3-1015	6.95
PT1472	9.95
TR1602	3.95
2350	9.95
2651	8.95
TMS6011	5.95
IM6402	7.95
IM6403	8.95
INS8250	14.95

KEYBOARD CHIPS

AY5-2376	11.95
AY5-3600	11.95

CLOCK CIRCUITS

MM5314	4.95
MM5369	3.95
MM5375	4.95
MM58167	8.95
MM58174	11.95
MSM5832	6.95

Z-80

2.5 Mhz

Z80-CPU	3.95
Z80-CTC	5.95
Z80-DART	15.25
Z80-DMA	17.50
Z80-PIO	5.75
Z80-SIO/0	18.50
Z80-SIO/1	18.50
Z80-SIO/2	18.50
Z80-SIO/9	16.95

4.0 Mhz

Z80A-CPU	6.00
Z80A-CTC	8.65
Z80A-DART	18.75
Z80A-DMA	27.50
Z80A-PIO	6.00
Z80A-SIO/0	22.50
Z80A-SIO/1	22.50
Z80A-SIO/2	22.50
Z80A-SIO/9	19.95

6.0 Mhz

Z80B-CPU	17.95
Z80B-CTC	15.50
Z80B-PIO	15.50

ZILOG

Z6132	34.95
Z8671	39.95

CRYSTALS

32.768 khz	1.95
1.0 mhz	4.95
1.8432	4.95
2.0	3.95
2.097152	3.95
2.4576	3.95
3.2768	3.95
3.579535	3.95
4.0	3.95
5.0	3.95
5.0688	3.95
5.185	3.95
5.7143	3.95
6.0	3.95
6.144	3.95
6.5536	3.95
8.0	3.95
10.738635	3.95
14.31818	3.95
15.0	3.95
16.0	3.95
17.430	3.95
18.0	3.95
18.432	3.95
20.0	3.95
22.1184	3.95
32.0	3.95

DATA ACQUISITION

ADC0800	15.55
ADC0804	3.49
ADC0809	4.49
ADC0817	9.95
DAC0800	4.95
DAC0806	1.95
DAC0808	2.95
DAC1020	8.25
DAC1022	5.95
MC1408L6	1.95
MC1408L8	2.95

8000

8035	5.95
8039	6.95
INS-8060	17.95
INS-8073	24.95
8080	3.95
8085	5.95
8085A-2	11.95
8086	29.95
8087	CALL
8088	39.95
8089	89.95
8155	7.95
8156	8.95
8185	29.95
8185-2	39.95
8741	39.95
8748	29.95
8755	32.00

8200

8202	29.95
8203	39.95
8205	3.50
8212	1.80
8214	3.85
8216	1.75
8224	2.25
8226	1.80
8228	3.49
8237	19.95
8238	4.49
8243	4.45
8250	10.95
8251	4.49
8253	6.95
8253-5	7.95
8255	4.49
8255-5	5.25
8257	7.95
8257-5	8.95
8259	6.90
8259-5	7.50
8271	39.95
8272	39.95
8275	29.95
8279	8.95
8279-5	10.00
8282	6.50
8283	6.50
8284	5.50
8286	6.50
8287	6.50
8288	25.00
8289	49.95

FUNCTION GENERATORS

MC4024	3.95
LM566	1.49
XR2206	3.75
8038	3.95

INTERSIL

ICL7103	9.50
ICL7106	9.95
ICL7107	12.95
ICL7660	2.95
ICL8038	3.95
ICM7207A	5.59
ICM7208	15.95

6800

68000	59.9
6800	4.9
6802	7.9
6808	13.9
6809E	19.9
6809	12.9
6810	2.9
6820	4.9
6821	3.2
6828	14.9
6840	12.9
6843	34.9
6844	25.9
6845	14.9
6847	12.2
6850	3.4
6852	5.7
6860	9.9
6862	11.9
6875	6.9
6880	2.2
6883	24.9
68047	24.9
68488	19.9

6800 = 1MHZ

68B00	10.9
68B02	22.2
68B09E	29.9
68B09	29.9
68B10	7.9
68B21	12.9
68B45	35.9
68B50	12.9

68B00 = 2 MHZ

6500

1 MHZ

6502	5.9
6504	6.9
6505	8.9
6507	9.9
6520	4.3
6522	8.7
6532	11.2
6545	22.5
6551	11.6

2 MHZ

6502A	9.9
6522A	11.7
6532A	12.4
6545A	28.5
6551A	12.9

3 MHZ

6502B	14.9

EXAR

XR 2206	3.1
XR 2207	3.4
XR 2208	3.9
XR 2211	5.2
XR 2240	3.2

9000 SERIES

9316	1.0
9334	2.9
9368	3.9
9401	9.9
9601	.9
9602	1.9
96S02	1.9

JDR MICRODEVICES, INC.

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TERMS: For shipping include $2 for UPS Ground or $3 for UPS Blue Label Air. Items over 5 pounds require additional shipping charges. Foreign orders, include sufficient amount for shipping. There is a $10 minimum order. Bay Area and Los Angeles Counties add 6½% Sales Tax. Other California residents add 6% Sales Tax. We reserve the right to substitute manufacturer. Not responsible for typographical errors. Prices are subject to change without notice. We will match or beat any competitor's price provided it is not below our cost.

Circle 84 on Reader Service card.

2716 16K EPROMS $3.95 EACH

2732 32K EPROMS $4.95 EACH

ALL MERCHANDISE 100% GUARANTEED!

CALL US FOR VOLUME QUOTES

74LS00

LS00	.24	74LS86	.39	74LS169	1.75	74LS323	3.50
LS01	.25	74LS90	.55	74LS170	1.49	74LS324	1.75
LS02	.25	74LS91	.89	74LS173	.69	74LS352	1.29
LS03	.25	74LS92	.55	74LS174	.55	74LS353	1.29
LS04	.24	74LS93	.55	74LS175	.55	74LS363	1.35
LS05	.25	74LS95	.75	74LS181	2.15	74LS364	1.95
LS08	.28	74LS96	.89	74LS189	8.95	74LS365	.49
LS09	.29	74LS107	.39	74LS190	.89	74LS366	.49
LS10	.25	74LS109	.39	74LS191	.89	74LS367	.45
LS11	.35	74LS112	.39	74LS192	.79	74LS368	.45
LS12	.35	74LS113	.39	74LS193	.79	74LS373	.99
LS13	.45	74LS114	.39	74LS194	.69	74LS374	.99
LS14	.59	74LS122	.45	74LS195	.69	74LS377	1.39
LS15	.35	74LS123	.79	74LS196	.79	74LS378	1.18
LS20	.25	74LS124	2.90	74LS197	.79	74LS379	1.35
LS21	.29	74LS125	.49	74LS221	.89	74LS385	1.90
LS22	.25	74LS126	.49	74LS240	.95	74LS386	.45
LS26	.29	74LS132	.59	74LS241	.99	74LS390	1.19
LS27	.29	74LS133	.59	74LS242	.99	74LS393	1.19
LS28	.35	74LS136	.39	74LS243	.99	74LS395	1.19
LS30	.25	74LS137	.99	74LS244	.99	74LS399	1.49
LS32	.29	74LS138	.55	74LS245	1.49	74LS424	2.95
LS33	.55	74LS139	.55	74LS247	.75	74LS447	.37
LS37	.35	74LS145	1.20	74LS248	.99	74LS490	1.95
LS38	.35	74LS147	2.49	74LS249	.99	74LS624	3.99
LS40	.25	74LS148	1.35	74LS251	.59	74LS668	1.69
LS42	.49	74LS151	.55	74LS253	.59	74LS669	1.89
LS47	.75	74LS153	.55	74LS257	.59	74LS670	1.49
LS48	.75	74LS154	1.90	74LS258	.59	74LS674	9.65
LS49	.75	74LS155	.69	74LS259	2.75	74LS682	3.20
LS51	.25	74LS156	.69	74LS260	.59	74LS683	3.20
LS54	.29	74LS157	.65	74LS266	.55	74LS684	3.20
LS55	.29	74LS158	.59	74LS273	1.49	74LS685	3.20
LS63	1.25	74LS160	.69	74LS275	3.35	74LS688	2.40
LS73	.39	74LS161	.65	74LS279	.49	74LS689	3.20
LS74	.35	74LS162	.69	74LS280	1.98	74LS783	24.95
LS75	.39	74LS163	.65	74LS283	.69	81LS95	1.49
LS76	.39	74LS164	.69	74LS290	.89	81LS96	1.49
LS78	.49	74LS165	.95	74LS293	.89	81LS97	1.49
LS83	.60	74LS166	1.95	74LS295	.99	81LS98	1.49
LS85	.69	74LS168	1.75	74LS298	.89	25LS2521	2.80
				74LS299	1.75	25LS2569	4.25

IC SOCKETS

	1-99	100
8 pin ST	.13	.11
14 pin ST	.15	.12
16 pin ST	.17	.13
18 pin ST	.20	.18
20 pin ST	.29	.27
22 pin ST	.30	.27
24 pin ST	.30	.27
28 pin ST	.40	.32
40 pin ST	.49	.39
64 pin ST	4.25	call
ST = SOLDERTAIL		
8 pin WW	.59	.49
14 pin WW	.69	.52
16 pin WW	.69	.58
18 pin WW	.99	.90
20 pin WW	1.09	.98
22 pin WW	1.39	1.28
24 pin WW	1.49	1.35
28 pin WW	1.69	1.49
40 pin WW	1.99	1.80
WW = WIREWRAP		
16 pin ZIF	6.75	call
24 pin ZIF	9.95	call
28 pin ZIF	10.95	call
ZIF = TEXTOOL (Zero Insertion Force)		

CONNECTORS

RS232 MALE	2.95
RS232 FEMALE	3.50
RS232 FEMALE RIGHT ANGLE	5.25
RS232 HOOD	1.25
S-100 ST	3.95
S-100 WW	4.95

DIP SWITCHES

4 POSITION	.85
5 POSITION	.90
6 POSITION	.90
7 POSITION	.95
8 POSITION	.95

7400

7400	.19	74132	.45
7401	.19	74136	.50
7402	.19	74141	.65
7403	.19	74142	2.95
7404	.19	74143	2.95
7405	.25	74145	.60
7406	.29	74147	1.75
7407	.29	74148	1.20
7408	.24	74150	1.35
7409	.19	74151	.55
7410	.19	74152	.65
7411	.25	74153	.55
7412	.30	74154	1.25
7413	.35	74155	.75
7414	.49	74156	.65
7416	.25	74157	.55
7417	.25	74159	1.65
7420	.19	74160	.85
7421	.35	74161	.69
7422	.35	74162	.85
7423	.29	74163	.69
7425	.29	74164	.85
7426	.29	74165	.85
7427	.29	74166	1.00
7428	.45	74167	2.95
7430	.19	74170	1.65
7432	.29	74172	5.95
7433	.45	74173	.75
7437	.29	74174	.89
7438	.29	74175	.89
7440	.19	74176	.89
7442	.49	74177	.75
7443	.65	74178	1.15
7444	.69	74179	1.75
7445	.69	74180	.75
7446	.69	74181	2.25
7447	.69	74182	.75
7448	.69	74184	2.00
7450	.19	74185	2.00
7451	.23	74186	18.50
7453	.23	74190	1.15
7454	.23	74191	1.15
7460	.23	74192	.79
7470	.35	74193	.79
7472	.29	74194	.85
7473	.34	74195	.85
7474	.33	74196	.79
7475	.45	74197	.75
7476	.35	74198	1.35
7480	.59	74199	1.35
7481	1.10	74221	1.35
7482	.95	74246	1.35
7483	.50	74247	1.25
7485	.59	74248	1.85
7486	.35	74249	1.95
7489	2.15	74251	.75
7490	.35	74259	2.25
7491	.40	74265	1.35
7492	.50	74273	1.95
7493	.35	74276	1.25
7494	.65	74279	.75
7495	.55	74283	2.00
7496	.70	74284	3.75
7497	2.75	74285	3.75
74100	1.75	74290	.95
74107	.30	74293	.75
74109	.45	74298	.85
74110	.45	74351	2.25
74111	.55	74365	.65
74116	1.55	74366	.65
74120	1.20	74367	.65
74121	.29	74368	.65
74122	.45	74376	2.20
74123	.49	74390	1.75
74125	.45	74393	1.35
74126	.45	74425	3.15
74128	.55	74426	.85
		74490	2.55

CMOS

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4001	.25	4528	1.19
4002	.25	4531	.95
4006	.89	4532	1.95
4007	.29	4538	1.95
4008	.95	4539	1.95
4009	.39	4541	2.64
4010	.45	4543	1.19
4011	.25	4553	5.79
4012	.25	4555	.95
4013	.38	4556	.95
4014	.79	4581	1.95
4015	.39	4582	1.95
4016	.39	4584	.75
4017	.69	4585	.75
4018	.79	4702	12.95
4019	.39	74C00	.35
4020	.75	74C02	.35
4021	.79	74C04	.35
4022	.79	74C08	.35
4023	.29	74C10	.35
4024	.65	74C14	.59
4025	.29	74C20	.35
4026	1.65	74C30	.35
4027	.45	74C32	.39
4028	.69	74C42	1.29
4029	.79	74C48	1.99
4030	.39	74C73	.65
4034	1.95	74C74	.65
4035	.85	74C76	.80
4040	.75	74C83	1.95
4041	.75	74C85	1.95
4042	.69	74C86	.39
4043	.85	74C89	4.50
4044	.79	74C90	1.19
4046	.85	74C93	1.75
4047	.95	74C95	.99
4049	.35	74C107	.89
4050	.35	74C150	5.75
4051	.79	74C151	2.25
4053	.79	74C154	3.25
4060	.89	74C157	1.75
4066	.39	74C160	1.19
4068	.39	74C161	1.19
4069	.29	74C162	1.19
4070	.35	74C163	1.19
4071	.29	74C164	1.39
4072	.29	74C165	2.00
4073	.29	74C173	.79
4075	.29	74C174	1.19
4076	.79	74C175	1.19
4078	.29	74C192	1.49
4081	.29	74C193	1.49
4082	.29	74C195	1.39
4085	.95	74C200	5.75
4086	.95	74C221	1.75
4093	.49	74C373	2.45
4098	2.49	74C374	2.45
4099	1.95	74C901	.39
14409	12.95	74C902	.85
14410	12.95	74C903	.85
14411	11.95	74C905	10.95
14412	12.95	74C906	.95
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4502	.95	74C909	2.75
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74S20	.35	74S195	1.49
74S22	.35	74S196	1.49
74S30	.35	74S197	1.49
74S32	.40	74S201	6.95
74S37	.88	74S225	7.95
74S38	.85	74S240	2.20
74S40	.35	74S241	2.20
74S51	.35	74S244	2.20
74S64	.40	74S251	.95
74S65	.40	74S253	.95
74S74	.50	74S257	.95
74S85	1.99	74S258	.95
74S86	.50	74S260	.79
74S112	.50	74S274	19.95
74S113	.50	74S275	19.95
74S114	.55	74S280	1.95
74S124	2.75	74S287	1.90
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74S134	.50	74S301	6.95
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74S138	.85	74S374	2.45
74S139	.85	74S381	7.95
74S140	.55	74S387	1.95
74S151	.95	74S412	2.98
74S153	.95	74S471	4.95
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FND-500 (503)	.5"	CC	1.49
FND-507 (510)	.5"	CA	1.49

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Jumbo Green	.18	.15
Jumbo Yellow	.18	.15

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2N3055	NPN POWER	TO-3	.79	10/6.99
3055T	NPN POWER	TO-220	.69	10/5.99
2N3904	NPN SWITCH	TO-92	10/1.00	100/8.99
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LM301H	.79	LM350K	4.95	LM565	.99	LM1558H	3.10	CA 3039	1.29	CA 3083	1.55
LM307	.45	LM350T	4.60	LM566	1.49	LM1800	2.37	CA 3046	1.25	CA 3086	.80
LM308	.69	LM358	.69	LM567	.89	LM1812	8.25	CA 3059	2.90	CA 3089	2.99
LM308H	1.15	LM359	1.79	NE570	3.95	LM1830	3.50	CA 3060	2.90	CA 3096	3.49
LM309H	1.95	LM376	3.75	NE571	2.95	LM1871	5.49	CA 3065	1.75	CA 3130	1.30
LM309K	1.25	LM377	1.95	NE592	2.75	LM1872	5.49	CA 3080	1.10	CA 3140	1.15
LM310	1.75	LM378	2.50	LM703	.89	LM1877	3.25	CA 3081	1.65	CA 3146	1.85
LM311	.64	LM379	4.50	LM709	.59	LM1889	1.95			CA 3160	1.19
LM311H	.89	LM380	.89	LM710	.75	LM1896	1.75				
LM312H	1.75	LM380N-8	1.10	LM711	.79	LM2877	2.05				
LM317K	3.95	LM381	1.60	LM723	.49	LM2878	2.25				
LM317T	1.19	LM382	1.60	LM723H	.55	LM2900	.85				
LM318	1.49	LM383	1.95	LM733	.98	LM2901	1.00				
LM318H	1.59	LM384	1.95	LM741	.35	LM3900	.59				
LM319H	1.90	LM386	.89	LM741N-14	.35	LM3905	1.25				
LM319	1.25	LM387	1.40	LM741H	.40	LM3909	.98				
LM320 (see 7900)		LM389	1.35	LM747	.69	LM3911	2.25				
LM322	1.65	LM390	1.95	LM748	.59	LM3914	3.95				
LM323K	4.95	LM392	.69	LM1014	1.19	LM3915	3.95				
LM324	.59	LM394H	4.60	LM1303	1.95	LM3916	3.95				
LM329	.65	LM399H	5.00	LM1310	1.49	MC4024	3.95				
LM331	3.95	NE531	2.95	MC1330	1.69	MC4044	4.50				
LM334	1.19	NE536	6.00	MC1349	1.89	RC4136	1.25				
LM335	1.40	NE555	.34	MC1350	1.19	RC4151	3.95				
LM336	1.75	NE556	.65	MC1358	1.69	LM4250	1.75				
LM337K	3.95	NE558	1.50	MC1372	6.95	LM4500	3.25				
LM337T	1.95	NE555	.34	LM1414	1.59	LM13080	1.29				
LM338K	6.95	NE556	.65	LM1458	.59	LM13600	1.49				
LM339	.99	NE558	1.50	LM1488	.69	LM13700	1.49				
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H = TO-5 CAN T = TO-220 K = TO-3

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TL496	1.65	75450	.59
TL497	3.25	75451	.39
75107	1.49	75452	.39
75110	1.95	75453	.39
75150	1.95	75454	.39
75154	1.95	75491	.79
75188	1.25	75492	.79
75189	1.25	75493	.89
		75494	.89

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TL072	1.19	LF347	2.19
TL074	2.19	LF351	.60
TL081	.79	LF353	1.00
TL082	1.19	LF355	1.10
TL083	1.19	LF356	1.10
		LF357	1.40

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7808T	.89	7908T	.99
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7824T	.89	7924T	.99
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7812K	1.39	7912K	1.49
7815K	1.39	7915K	1.49
7824K	1.39	7924K	1.49
78L05	.69	79L05	.79
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78L15	.69	79L15	.79
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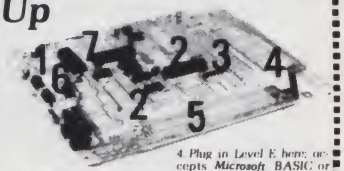

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2. Add Level B to convert to S100
3. Add 4k RAM
4. Plug in Level E here; accepts *Microsoft* BASIC or Editor/Assembler in ROM
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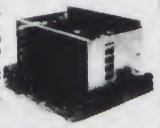

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LM323K-+5v-3A. TO-3 ..... 3.50 3/9.00
LAS 1412-+12v-3A TO-3 ..... 3.50 3/9.00
7812CK-TO-3 +12V, 1A 1.00
7905-TO-3 -5v 1A 1.00

MISCELLANEOUS

AY3-8910 w/60 pg. manual ... 9.95
8T97 ..... .49
MC 1408L6 D to A 8 Bit 1.79
8002 Char. Gen. 11.95
DM8131 ..... 1.50

UART
TR1602-UART same as AY5-1013 ..... 1.99
IM6402-+5v High speed UART-AY5-1013 pin out 1.65
INS 8250B 9.95

FDC
1771 Single Density FDC 17.50
1791 Double Density FDC ... 23.50
1797 - FDC 20.95

CRT CONT.
5027 Programmable-24x80 ... 10.95
5037 ..... 14.95
68B45 - Motorola (HD46505SP) CRT Controller - 2MHZ 17.50

BIT SLICE

AMD2901-4 Bit Slice 7.95
AMD2903-4 Bit Super Slice 12.95
AMD2911 Sequencer 3.95
AMD29705-16 Register Files 4.95

BAUD RATE GENERATOR

COM8116 ..... 9.50
INS8250B 9.95

Z80

Z80 2.5 MHZ CPU 3.50
Z80DMA-DMA Controller 9.95
Z80PIO - Parallel 3.95
Z80SIO/O Chan. Ser. 16.95
Z80A-4MHZ CPU 4.95
Z80A DART 9.95
Z80A-PIO 5.95
Z80A SIO/O 19.95
Z80B 6 MHZ CPU 14.95

EPROM SPECIAL

We bought a large quantity of 2708s from a computer manufacturer who redesigned their boards. We removed them from sockets, erased and verified them, and now we offer the savings to you. Complete satisfaction guaranteed.

2708
$1.49 or 10/$12.00

EPROM

1702A 256X8 1 us 2.00
2708 1KX8 450 n.s. 2.20
27A08 1KX8 350 n.s. 3.95
2758 1KX8 +5V 450 n.s 3.95
2716 2KX8+5v 450 n.s. 3.20
2716-1 2KX8+5v 350 n.s. 7.95
2732 4KX8 450 n.s. Intel P. O. ... 4.75
2732A-2 200 n.s. Special 6.95
2732A-3 4K x 8 300 n.s. L.P. Special 5.95
2532 4KX8 450 n.s. T.I. P. O. 7.00
2764 - 450 n.s. 9.95

SOCKETS

Low Profile SOLDER TAIL

8 Pin	13/1.00
14 Pin	10/1.00
16 Pin	8/1.00
18 Pin	8/1.00
20 Pin	7/1.00
24 Pin	6/1.00
28 Pin	6/1.00
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GET $1.00 — FREE CHOICE

TERMS: Add $1.50 postage, we pay balance. Orders over $50.00 add 85¢ for insurance. No C.O.D. Texas Res. add 5% Tax. 90 Day Money Back Guarantee on all items. All items subject to prior sale. Prices subject to change without notice. Foreign order - U.S. funds only. We cannot ship to Mexico. Countries other than Canada, add $3.50 shipping and handling.

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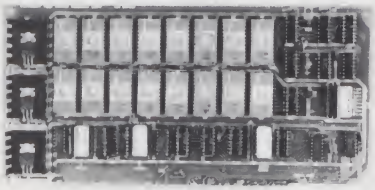
(214) 271-3538

32K S-100 EPROM CARD
PRICE CUT!



$59.95

USES 2716's

Blank PC Board - $34

ASSEMBLED & TESTED ADD $30

SPECIAL: 2716 EPROM's (450 NS) Are $4.95 Ea. With Above Kit.

KIT FEATURES
1. Uses +5V only 2716 (2Kx8) EPROM's
2. Allows up to 32K of software on line!
3. IEEE S-100 Compatible
4. Addressable as two independent 16K blocks
5. Cromemco extended or Northstar bank select
6. On board wait state circuitry if needed
7. Any or all EPROM locations can be disabled
8. Double sided PC board solder masked silk screened
9. Gold plated contact fingers
10. Unselected EPROM's automatically powered down for low power
11. Fully buffered and bypassed
12. Easy and quick to assemble

64K S100 STATIC RAM
$269.00 KIT

NEW!

LOW POWER!

RAM OR EPROM!

BLANK PC BOARD WITH DOCUMENTATION $55

SUPPORT ICs + CAPS $17.50

FULL SOCKET SET $14.50

FULLY SUPPORTS THE NEW IEEE 696 S100 STANDARD (AS PROPOSED)

FOR 56K KIT $219

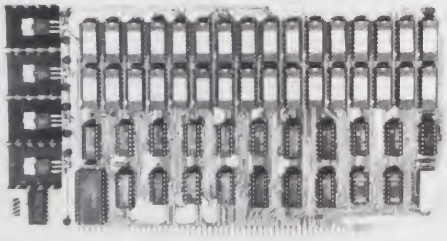
ASSEMBLED AND TESTED ADD $40

FEATURES:
- Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
- Fully supports IEEE 696 24 BIT Extended Addressing.
- 64K draws only approximately 500 MA.
- 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
- SUPPORTS PHANTOM (BOTH LOWER 32K AND ENTIRE BOARD).
- 2716 EPROMs may be installed in any of top 48K.
- Any of the top 8K (E000 H AND ABOVE) may be disabled to provide windows to eliminate any possible conflicts with your system monitor, disk controller, etc.
- Perfect for small systems since BOTH RAM and EPROM may co-exist on the same board.
- BOARD may be partially populated as 56K.

16K STATIC RAM KIT-S 100 BUSS
PRICE CUT!

$119.95 KIT

FOR 4MHZ ADD $10



KIT FEATURES
1. Addressable as four separate 4K Blocks
2. ON BOARD BANK SELECT circuitry (Cromemco Standard!) Allows up to 512K on line!
3. Uses 2114 (450NS) 4K Static Rams
4. ON BOARD SELECTABLE WAIT STATES
5. Double sided PC Board with solder mask and silk screened layout. Gold plated contact fingers
6. All address and data lines fully buffered
7. Kit includes ALL parts and sockets
8. PHANTOM is jumpered to PIN 67
9. LOW POWER under 1.5 amps TYPICAL from the +8 Volt Buss
10. Blank PC Board can be populated as any multiple of 4K

BLANK PC BOARD W DATA $33

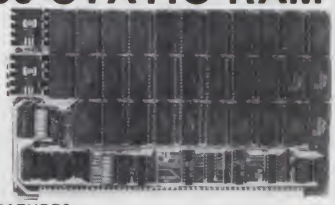
LOW PROFILE SOCKET SET-$12

SUPPORT IC'S & CAPS-$19.95

ASSEMBLED & TESTED-ADD $35

OUR #1 SELLING RAM BOARD!

64K SS-50 STATIC RAM
$199.00 (48K KIT)



NEW!

LOW POWER!

RAM OR EPROM!

BLANK PC BOARD WITH DOCUMENTATION $52

SUPPORT ICs + CAPS $18.00

FULL SOCKET SET $15.00

56K Kit $249

64K Kit $299

ASSEMBLED AND TESTED ADD $40

FEATURES:
- Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
- Fully supports Extended Addressing.
- 64K draws only approximately 500 MA.
- 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
- Board is configured as 3-16K blocks and 8-2K blocks (within any 64K block) for maximum flexibility.
- 2716 EPROMs may be installed anywhere on Board.
- Top 16K may be disabled in 2K blocks to avoid any I/O conflicts.
- One Board supports both RAM and EPROM.
- RAM supports 2MHZ operation at no extra charge!
- Board may be partially populated in 16K increments.

STEREO! S-100 SOUND COMPUTER BOARD
NEW!

At last, an S-100 Board that unleashes the full power of two unbelievable General Instruments AY3-8910 NMOS computer sound IC's. Allows you under total computer control to generate an infinite number of special sound effects for games or any other program. Sounds can be called in BASIC ASSEMBLY LANGUAGE, etc.

KIT FEATURES:
- TWO GI SOUND COMPUTER IC'S
- FOUR PARALLEL I/O PORTS ON BOARD
- USES ON BOARD AUDIO AMPS OR YOUR STEREO
- ON BOARD PROTO TYPING AREA
- ALL SOCKETS, PARTS AND HARDWARE ARE INCLUDED
- PC BOARD IS SOLDERMASKED, SILK SCREENED WITH GOLD CONTACTS
- EASY, QUICK, AND FUN TO BUILD WITH FULL INSTRUCTIONS
- USES PROGRAMMED I/O FOR MAXIMUM SYSTEM FLEXIBILITY

Both Basic and Assembly Language Programming examples are included

COMPLETE KIT! **$69.95** (WITH DATA MANUAL)

BLANK PC BOARD W/DATA $31

SOFTWARE:
SCL™ is now available! Our Sound Command Language makes writing Sound Effects programs a SNAP! SCL™ also includes routines for Register-Examine-Modify, Memory-Examine-Modify, and Play-Memory. SCL™ is available on CP/M* compatible diskette or 2708 or 2716. Diskette - **$24.95**. 2708 - **$19.95**. 2716 - **$29.95**. Diskette includes the source. EPROM'S are ORG at E000H. **(Diskette is 8 Inch Soft Sectored)**

NEW! G.I. COMPUTER SOUND CHIP

AY3-8910. As featured in July, 1979 BYTE! A fantastically powerful Sound & Music Generator. Perfect for use with any 8 Bit Microprocessor. Contains: 3 Tone Channels, Noise Generator, 3 Channels of Amplitude Control, 16 bit Envelope Period Control, 2-8 Bit Parallel I/O, 3 D to A Converters, plus much more! All in one 40 Pin DIP. Super easy interface to the S-100 or other busses. **$9.95** **PRICE CUT!**

SPECIAL OFFER: ~~$14.95~~ each Add $3 for 60 page Data Manual.

32K S100 EPROM/STATIC RAM

NEW! FOUR FUNCTION BOARD! NEW!

EPROM II FULL EPROM KIT $80.00

A&T EPROM ADD $35.00

BLANK PC BOARD WITH DATA $39.95

SUPPORT IC'S PLUS CAPS $23.00

FULL SOCKET SET $18

We took our very popular 32K S100 EPROM Card and added additional logic to create a more versatile EPROM/RAM Board.

FEATURES:
- This one board can be used in any one of four ways:
  - A. As a 32K 2716 EPROM Board
  - B. As a 32K 2732 EPROM Board (Using Every Other Socket)
  - C. As a mixed 32K 2716 EPROM/2K x 8 RAM Board
  - D. As a 32K Static RAM Board
- Uses New 2K x 8 (TMM2016 or HM6116) RAM's
- Fully Supports IEEE 696 Buss Standard (As Proposed)
- Supports 24 Bit Extended Adressing
- 200 NS (FAST!) RAM'S are standard on the RAM Kit
- Supports both Cromemco and North Star Bank Select
- Supports Phantom
- On Board wait State Generator
- Every 2K Block may be disabled
- Addressed as two separate 16K Blocks on any 64K Boundary
- Perfect for MP/M* Systems
- RAM Kit is very low power (300 MA typical)

32K STATIC RAM KIT — $139.95
For RAM Kit A&T - Add $40

TERMS: Add $2.00 postage. We pay balance. Orders under $15 add 75¢ handling. No C.O.D. We accept Visa and MasterCharge. Tex. Res. add 5% Tax. Foreign orders (except Canada) add 20% P & H. Orders over $50, add 85¢ for insurance.

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ALL SALES ARE MADE SUBJECT TO THE TERMS OF OUR 90 DAY LIMITED WARRANTY. A COPY OF THIS WARRANTY IS AVAILABLE FREE, ON REQUEST.

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OEM - INDUSTRIAL - BUSINESS - SCIENTIFIC

SINGLE BOARD COMPUTER KIT!

Z-80 CPU! 64K RAM!

(DO NOT CONFUSE WITH ANY OF OUR FLATTERING IMITATORS!)

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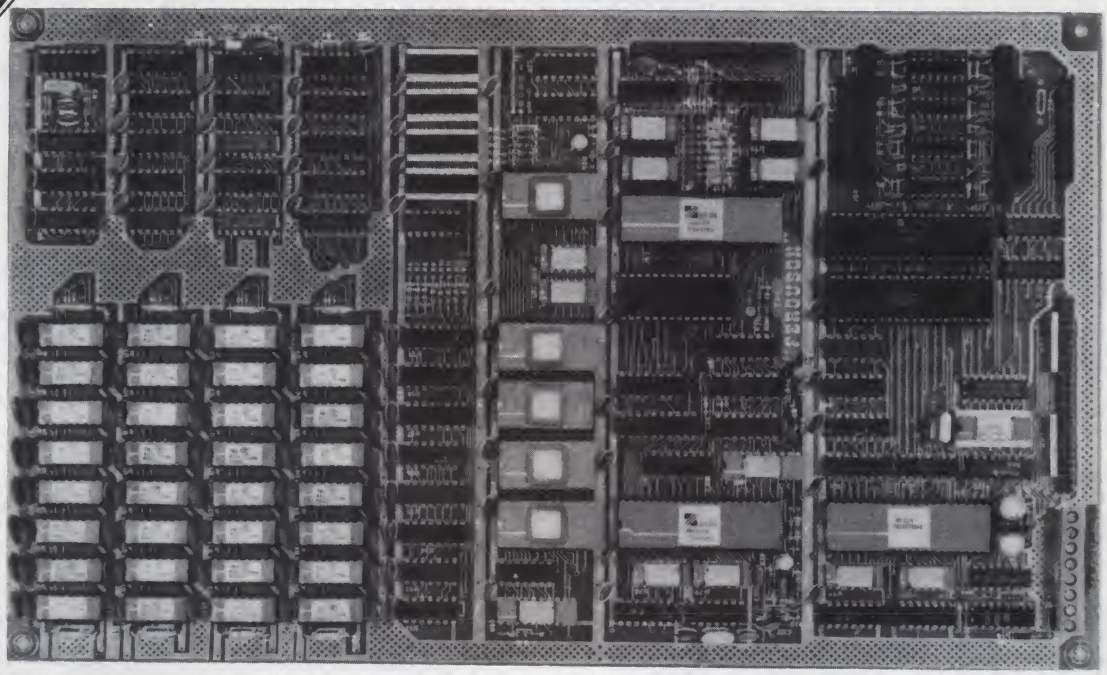
PARTIALLY ASSEMBLED KITS
For All Sockets Installed
And Soldered Add $50.
(Not For Blank PCB)



WANT MORE INFO?
Full Documentation and
Schematics — $5.

THE BIG BOARD PROJECT: With thousands sold worldwide and over two years of field experience, the Big Board may just be one of the most reliable single board computers available today. This is the same design that was licensed by Xerox Corp. as the basis for their 820 computer.

The Big Board gives you the right mix of most needed computing features all on one board. The Big Board was designed from scratch to run the latest version of CP/M*. Just imagine all the off-the-shelf software that can be run on the Big Board without any modifications needed.

$319.00 ** (64K KIT BASIC I/O)

SIZE: 8½ x 13¾ IN.
SAME AS AN 8 IN. DRIVE.
REQUIRES: +5V @ 3 AMPS
+ - 12V @ .5 AMPS.

FULLY SOCKETED!

FEATURES: (Remember, all this on one board!)

64K RAM

Uses Industry standard 4116 RAM's. All 64K is available to the user, our VIDEO and EPROM sections do not make holes in system RAM. Also, very special care was taken in the RAM array PC layout to eliminate potential noise and glitches.

Z-80 CPU

Running at 2.5 MHZ. Handles all 4116 RAM refresh and supports Mode 2 INTERUPTS. Fully buffered and runs 8080 software.

SERIAL I/O (OPTIONAL)

Full 2 channels using the Z80 SIO and the SMC 8116 Baud Rate Generator. FULL RS232! For synchronous or asynchronous communication. In synchronous mode, the clocks can be transmitted or received by a modem. Both channels can be set up for either data-communication or data-terminals. Supports mode 2 Int. Price for all parts and connectors: $39.95

BASIC I/O

Consists of separate parallel port (Z80 PIO) for use with an ASCII encoded keyboard for input. Output would be on the 80 x 24 Video Display.

BLANK PC BOARD — $119

The blank Big Board PC Board comes complete with full documentation (including schematics), the character ROM, the PFM 3.3 MONITOR ROM, and a diskette with the source of our BIOS, BOOT, and PFM 3.3 MONITOR.

24 x 80 CHARACTER VIDEO

With a crisp, flicker-free display that looks extremely sharp even on small monitors. Hardware scroll and full cursor control. Composite video or split video and sync. Character set is supplied on a 2716 style ROM, making customized fonts easy. Sync pulses can be any desired length or polarity. Video may be inverted or true. 5 x 7 Matrix - Upper & Lower Case.

FLOPPY DISC CONTROLLER

Uses WD1771 controller chip with a TTL Data Separator for enhanced reliability. IBM 3740 compatible. Supports up to four 8 inch disc drives. Directly compatible with standard Shugart drives such as the SA800 or SA801. Drives can be configured for remote AC off-on. Runs CP/M* 2.2.

TWO PORT PARALLEL I/O (OPTIONAL)

Uses Z-80 PIO. Full 16 bits, fully buffered, bi-directional. Uses selectable hand shake polarity. Set of all parts and connectors for parallel I/O: $19.95

REAL TIME CLOCK (OPTIONAL)

Uses Z-80 CTC. Can be configured as a Counter on Real Time Clock. Set of all parts: $9.95

CP/M* 2.2 FOR BIG BOARD

The popular CP/M* D.O.S. to run on Big Board is available for $139.00.

BIG BOARD SOFTWARE SPECIAL — $149

Through special arrangement with CDL we offer a powerful package of TDL Z-80 software that has a suggested retail of almost $600. Includes: Extended Disk Business Basic, ZEDIT text editor, MACRO II Macro Assembler, LINKER, DEBUG I and DEBUG II. Supplied on 8 in. diskette with extensive manual.

PFM 3.3 2K SYSTEM MONITOR

The real power of the Big Board lies in its PFM 3.3 on board monitor. PFM commands include: Dump Memory, Boot CP/M*, Copy, Examine, Fill Memory, Test Memory, Go To, Read and Write I/O Ports, Disc Read (Drive, Track, Sector), and Search PFM occupies one of the four 2716 EPROM locations provided. Z-80 is a Trademark of Zilog.

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TERMS: Shipments will be made approximately 3 to 6 weeks after we receive your order. VISA, MC, cash accepted. We will accept COD's (for the Big Board only) with a $75 deposit. Balance UPS COD. Add $4.00 shipping.

USA AND CANADA ONLY

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Store Hours:
Weekdays 10 to 6pm.
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Diskette SALE!!

"Wabash"

	5¼	8inch
SS/SD	18.50	21.50
SS/DD	27.40	30.40
DS/SD	ø	34.90
DS/DD	32.40	37.40

[QTY. PRICE AVAIL.]

Authorized Wabash Dist.

Bare Bones APPLE II

EURO

w/o Keyboard = 48K RAM =

$399.

w/o Pwr. Supply

Microswitch Keyboard	Power Supply w/ Purchase	APPLE Reference Manl.
$75.00	$95.00	$18.00

Power Supply 'FOR APPLE'

vlt. 5 → 3.5A
12 → 2.0A
−5 → 500MA
−12 → 500MA

$ 98.00

RANA Systems 'Apple Drive'

$450.00 w/ Controller

$375.00 w/o Controller

REAL-TIME CLOCK CALENDAR (MSM 5832)

$6.45 w/ SPEC's

XTAL $1.50

MONITORS

ZENITH # ZVM-121
12in. 15MHz. / GREEN Phos.
$105.00

BMC # BM-1200SU
12in. 18 MHz. / GREEN Phos.
Non-Glare Screen $125.50

AMDEK # CM-13 (COLOR I)
13in. / COLOR!!
$375.00

BMC # BM1401RGB
13in. "RGB" COLOR
with Apple interface!! $425.00

DISK DRIVE FOR APPLE!!

- metal cabinet
- 35 track
- with cable

$279.95

COMPUTER GAMES:

Apple & Atari (specify)

Choplifter → $24.95
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★Runs Apple Software

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'1982' IC MASTER

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5¼ in. $2.50 ea. → 5/ $10.00
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2764 → $15.95
2114L-2 → 8/$13.95
Z-80A → $5.50
8038c → $2.50

4116-200ns ★★ 8/$9.95 ★★

"GLOBAL" LPK-1:

Logic Probe Kit - complete nothing extra to buy Min pulse width 300nsec.

"TEXTOOL"

Z.I.F.

16pin → $6.35

24pin → $7.95

☆ ☆ More Specials ☆ ☆ ☆

3inch Mini FAN → $8.95
2111 → $2.45
8155 → $11.50
ER2501 → $4.95
AY5 1013A → $2.95
8202 → $29.95
6522 → $5.25
2716(+5V) → $3.55
2732 → $5.25
82S185 → $7.95
6331 → $1.75
AY3 8603 → $4.95
8255 → $4.50
3341PC → $2.00
6802 → $9.95
6116-P3-150ns → $6.50
4164-2oons $6.85
2901 → $2.95

COMPONENTS

7400 SERIES

7400	18	7454	19	74LS00	24	74LS83	70				
7402	18	7470	30	74LS02	24	74LS86	38				
7404	18	7472	25	74LS03	24	74LS90	60	74LS165	85		
7406	21	7474	30	74LS04	24	74LS91	85	74LS169	1 55		
7408	23	7475	40	74LS02	24	74LS92	65	74LS170	1 55		
7409	18	7478	30	74LS06	30	74LS93	65	74LS174	85		
7410	18	7480	55	74LS08	28	74LS95	80	74LS175	85		
7411	22	7481	1 00	74LS10	24	74LS107	38	74LS190	90		
7412	28	7489	3 95	74LS11	33	74LS109	38	74LS191	90		
7413	32	7490	30	74LS12	33	74LS112	40	74LS221	1 10		
7414	45	7491	35	74LS13	45	74LS113	40	74LS240	95		
7416	24	7492	45	74LS14	89	74LS114	45	74LS241	95		
7417	24	7494	60	74LS20	24	74LS122	40	74LS244	85		
7420	18	7495	50	74LS21	24	74LS123	85	74LS245	1 65		
7421	20	74100	90	74LS26	30	74LS125	90	74LS248	1 00		
7425	25	74107	25	74LS27	28	74LS126	65	74LS249	90		
7427	25	74132	40	74LS28	32	74LS132	70	74LS251	1 20		
7430	18	74135	40	74LS30	24	74LS136	50	74LS253	80		
7432	25	74144	2 50	74LS32	32	74LS138	65	74LS257	80		
7438	22	74145	70	74LS37	50	74LS139	65	74LS258	80		
7440	16	74148	1 00	74LS38	32	74LS145	1 10	74LS259	1 25		
7442	45	74154	1 00	74LS42	50	74LS151	70	74LS260	60		
7443	60	74157	45	74LS48	70	74LS153	70	74LS273	1 50		
7444	60	74160	80	74LS51	24	74LS157	70	74LS275	3 00		
7445	60	74161	80	74LS55	35	74LS158	70	74LS279	50		
7447	60	74166	90	74LS74	35	74LS161	85	74LS283	75		
7448	60	74174	80	74LS75	48	74LS162	85	74LS373	90		
7450	18	74181	1 95	74LS76	38	74LS163	85	74LS374	1 50		
7451	18	74393	1 00	74LS78	50	74LS164	85	74LS377	1 40		
7453	19										

74S SERIES

74S00	35	74S86	1 10	8T26	1 20
74S02	38	74S112	1 45	8T28	1 20
74S03	38	74S132	1 10	8038	2 75
74S04	45	74S138	95	8080A	3 75
74S05	65	74S140	1 25	8155	10 50
74S08	40	74S158	1 25	8255	4 50
74S10	55	74S174	95	MC1330	1 45
74S15	55	74S175	95	MC1350	1 10
74S20	55	74S181	4 00	MC1358	1 35
74S22	75	74S182	2 75	MC1458	55
74S30	35	74S188	3 50	LM380	1 10
74S37	1 25	74S240	3 50	LM386	1 40
74S51	60	74S244	3 50	LM565	95
74S65	95	74S471	9 50	LM741	25
74S74	55	74S472	15 00	LM1310	2 90
74S85	2 00				

MISC

8212	1 95
8216	1 80
1103A	95
N82S185	8 95
AY5 1013A	3 00
1488	95
1489	95
MC6802	9 95
MC6821P	4 95
MC6850P	3 25

MORE MISC

2111	2 85 8/2 50 ea
2112	2 85 8/2 50 ea
2114	2 00 4 14 00
2114L 200NS	2 25 4/2 00 ea
HM6116 150NS	8 25

SOCKETS

	ww	p	st
		8	10/1 20
		14	10/1 30
		16	10/1 40
		18	10/1 80
		20	10/2 70
		22	10/2 70
		24	10/2 70
		28	10/3 00
		40	10/3 90
	ww=wirewrap		solder

VOLTAGE REGULATORS

7805	
7806	
7808	
7812	
7818	85
7905	
7908	
7912	
7918	

CPUS

Z80	8 50
Z80A	9 00
Z80A PIO	9 00
6502	6 00
6502A	12 00
6809A	8 50
MC6800	7 75

DYNAMIC RAMS

4027	2 00 8/1 75 ea
4116 200NS	1 50
4164 200NS	8 50

EPROMS

1702	4 25	8/3 95 ea
2708	3 25	8/2 99 ea
2716(5V)	3 95	8/3 65 ea
TMS2716	8 95	8/8 00 ea
2732(5V)	8 95	8/7 75 ea
TMS2532	11 50	8/10 25 ea

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- ☐ 3. Atari 400
- ☐ 4. Atari 800
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- ☐ 7. Heath H89
- ☐ 8. Heath Z/90
- ☐ 9. Hewlett-Packard
- ☐ 10. IBM PC
- ☐ 11. Osborne I
- ☐ 12. OSI
- ☐ 13. PET
- ☐ 14. PMC-80/81
- ☐ 15. S-100 based system Which one?_____
- ☐ 16. Sinclair ZX-80
- ☐ 17. Sinclair ZX-81/Timex 1000
- ☐ 18. TI 99/4 A
- ☐ 19. TRS-80 Mod I
- ☐ 20. TRS-80 Mod II
- ☐ 21. TRS-80 Mod III
- ☐ 22. TRS-80 Color
- ☐ 23. TRS-80 Pocket
- ☐ 24. VIC-20
- ☐ 25. Other (specify)_____
- ☐ 26. Don't yet own one

B. Would you purchase your next computer from the same manufacturer?
- ☐ 1. Yes
- ☐ 2. No

C. Are you currently using CP/M on your system?
- ☐ 1. Yes
- ☐ 2. No

D. What types of software have you purchased during the last year?
- ☐ 1. Word Processing
- ☐ 2. Database Management
- ☐ 3. Game
- ☐ 4. Utility
- ☐ 5. Business
- ☐ 6. Home Finance/Household
- ☐ 7. Education
- ☐ 8. Scientific
- ☐ 9. Other (please specify)_____

E. What types of software do you plan to purchase during the next year?
- ☐ 1. Word Processing
- ☐ 2. Database Management
- ☐ 3. Game
- ☐ 4. Utility
- ☐ 5. Business
- ☐ 6. Home Finance/Household
- ☐ 7. Education
- ☐ 8. Scientific
- ☐ 9. Other (please specify)_____

F. Where do your children use computers?
- ☐ 1. Home
- ☐ 2. School
- ☐ 3. Both
- ☐ 4. Don't use computers

G. What peripheral equipment have you purchased during the last year?
- ☐ 1. Printer
- ☐ 2. Plotter
- ☐ 3. Floppy disk drives
- ☐ 4. Hard disk drives
- ☐ 5. Expansion interface
- ☐ 6. Modem
- ☐ 7. Monitor
- ☐ 8. Other (please specify)_____

H. What peripheral equipment do you plan to purchase during the next year?
- ☐ 1. Printer
- ☐ 2. Plotter
- ☐ 3. Floppy disk drives
- ☐ 4. Hard disk drives
- ☐ 5. Expansion interface
- ☐ 6. Modem
- ☐ 7. Monitor
- ☐ 8. Other (please specify)_____

I. What low-end computer system(s) are you considering buying?
- ☐ 1. Commodore VIC
- ☐ 2. Commodore Max
- ☐ 3. Sinclair Spectrum
- ☐ 4. Sinclair Spectrum
- ☐ 5. ZX-81/Timex 1000
- ☐ 6. Atari 400
- ☐ 7. TRS-80 Color Computer

J. What is your annual household income?
- ☐ 1. Under $20,000
- ☐ 2. $20,000-$40,000
- ☐ 3. $40,000-$60,000
- ☐ 4. $60,00-$80,000
- ☐ 5. $80,000-$100,000
- ☐ 6. Over $100,000

K. I have stopped subscribing to the following publications:
- ☐ 1. Byte
- ☐ 2. Compute
- ☐ 3. Creative Computing
- ☐ 4. InfoWorld
- ☐ 5. Interface Age
- ☐ 6. Personal Computing
- ☐ 7. Popular Computing
- ☐ 8. Softalk
- ☐ 9. Other_____

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S-100 DUAL 8"2 SUBSYSTEM

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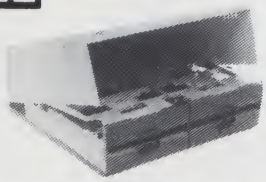
International Instrumentation Incorporated



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California Computer Systems

2 or 4MHz BANK SELECTABLE

● 2 or 4 MHz operation ● Designed to IEEE proposed S-100 bus standards ● Supports IMSAI-type front panels ● Operates with either an 8080 or Z-80 based S-100 system providing processor transparent refreshes with both ● Bank-select system allows system memory expansion ● Bank-select port's address is jumper selectable ● Any 16K block can be made bank-independent ● All 64K can be made bank-enabled on power-on and reset ● Fully buffered address and data lines ● Configuration as a 16K, 32K or 48K board without the removal of RAMs ● Fail-safe refresh circuitry for extended Wait States ● Board configuration with reliable, easy to configure Berg jumpers ● Supports DMA ● Jumper-selectable Phantom input ● Assembled & Tested ● All ICs in sockets ● Uses Popular 4116 RAMs ● Full factory warranty.

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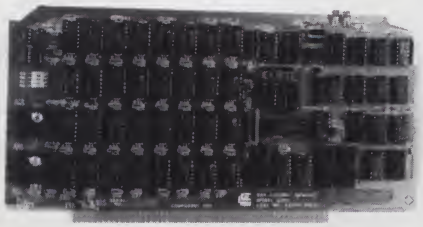

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S-100 STATIC RAM - ULTRA LOW POWER - ONLY 2 WATTS
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UNBELIEVABLE!! While the rest of the industry struggles to attain 6MHz, CompuPro has effortlessly jumped from 10 to 12MHz. The power consumption (400mA; 2 Watts) is still the lowest in spite of running nearly twice as fast. Priority One Electronics has purchased the remainder of CompuPro's 10MHz boards and are offering them at these unprecedented prices.

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***2 or More: $299.00 ea.**
KOGBTRAM17 Assembled & Tested

- Extremely low power consumption (2 watts typical)
- Flawlessly handles any DMA device per IEEE 696 specifications
- Single +5 Volt operation (requires no other supply voltages
- Switch-Selectable choice of 24 address lines conforming to *IEEE 696/S-100 extended* addressing
- 2K windows, individually selectable at E000, E800, F000, and F800 permits use with older memory-mapped disk controllers or ROM (i.e., Morrow, NorthStar)
- Any 16K block may be disabled; dip switch selectable 2K disable from XXE000 - FFFF in 2K increments
- Switch Selectable PHANTOM disable

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SALE PRICE: $349.00 ea.
List Price: $650.00
2 or More: $325.00 ea.
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- Board addressable as one 64K x 8 or 32K x 16 block; DIP switch selectable on any 64K boundary
- Extremely low power consumption (2 watts typical)
- Meets or exceeds all IEEE 696/S-100 specifications
- Flawlessly handles any DMA device per IEEE 696 specifications
- Single +5 Volt operation (requires no other supply voltages)
- 24 bit addressing; conforms to IEEE 696 specifications
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1200 BAUD AUTO-DIAL
HAYES SMARTMODEM COMPATIBLE
U.S. ROBOTICS MODEMS
$495.00

The **AUTO DIAL 212A** Modem is a direct connect 0-300 or 1200 baud modem capable of dialing and calling for you. **The AUTO DIAL 212A is compatible in function to the DC Hayes SMARTMODEM™.**

Part No.	Description	List	SALE Price
KOUSRAODIAL212A	0-300 1200 baud dialing modem	$599.00	$495.00

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(Does not include connectors)

KOIIIWPOB251 Single punched
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KDCNDDB25S	25 Pin Female	$4.00	$3.50	$3.25	$3.00
KOCNOOB51212	1 Pc. Grey Hood	$1.65	$1.40	$1.25	$1.15
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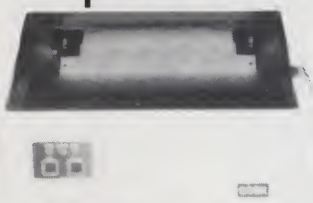
$329.00



COEX 80 F/T

- 80 cps ● 10, 12 or 16.5 cpi ● 3 selectable line spacing ● Vertical format control ● Centronics parallel or RS232 serial interface ● Uses a standard Underwood spooled ribbon ● Friction and tractor feed

		List Price	Our Price
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KOCOX80FTSER	Serial int.	$399.00	$329.00

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AXIOM CORPORATION

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SOFT SECTOR
40 TRACK SINGLE SIDED
DOUBLE DENSITY WITH
HUB REINFORCING RINGS

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Micro Software Digest

Compiled by Swain Pratt

Micro Software Digest presents a collection of capsulized software reviews from various computer-related publications. Micro Software Digest is presented in an index-card format; so read on and clip and keep your favorites.

HEATH/ZENITH

Text 4.0

System Requirements: Heath/Zenith H/Z-89, Z-90 or H-8, HDOS or CP/M, 40K RAM, one 5¼-inch or one 8-inch (CP/M only) disk drive
Manufacturer: The Software Toolworks, 14478 Glorietta Drive, Sherman Oaks, CA 91423
Price: $39.95
Comments: Text 4.0 is not a word processor or editor, but is, according to the review, "a text formatter which can transform anything you've written into any style or format you desire." To use it, an editor is needed.

"Text 4.0 is an excellent program," concludes the review, "especially for a professional writer. It is easy and pleasant to use for preparing a normal manuscript."
Reader Service Number 421

(Reviewed in InfoWorld, *December 27, 1982)*

PET

Supergraphics

System Requirements: PET/CBM computer
Manufacturer: AB Computers, 252 Bethlehem Pike, Colmar, PA 18915
Price: $45
Comments: "*Supergraphics*," states the review, "seems to be a well-thought-out enlargement of the PET's resident BASIC interpreter. Its Turtle graphics and general picture handling make it an ideal graphics package for children and adults."

According to the review, all commands work well, the mnemonics "are well chosen, and there is no ambiguity. The package is well worth the money."
Reader Service Number 412

(Reviewed in Compute!, *December, 1982)*

Z-80 SYSTEM

Quickcode

System Requirements: 8080, 8085 or Z80 system, CP/M 2.2, 48K RAM, 150K of disk space, dBASE II, version 2.3
Manufacturer: Fox and Geller Associates, 1260 Winthrop Road, Teaneck, NJ 07666
Price: $295
Comments: "Quickcode," says the review, "provides you with a quick and efficient method of creating a data base for dBASE II or of configuring an input form for CBASIC, Microsoft BASIC and Digital Research's PL/I."

"The program is well worth investigating," concludes the review, "if you need to have a lot of data entered by others or by yourself."
Reader Service Number 410

(Reviewed in InfoWorld, *December 27, 1982)*

APPLE

MicroTutor II

System Requirements: Apple II Plus, DOS 3.3, 48K RAM, one disk drive
Manufacturer: JMScandura Associates, Instructional Micro Systems, Inc., 1249 Greentree Lane, Narberth, PA 19072
Price: $400 for complete package of eight disks and manual
Comments: "*MicroTutor II*," says the review, "is an intelligent courseware package to instruct and evaluate language and word-structure skills." Designed for teachers working with elementary-school-level students, the program is highly structured, leading the students step-by-step, with review as necessary.

The review concludes that the program is, at a reasonable price, worthwhile for "teachers who need a strict diagnosis and prescription format."
Reader Service Number 416

(Reviewed in InfoWorld, *January, 1983)*

APPLE

Executive Briefing System

System Requirements: Apple II, 48K, two disk drives preferred, Applesoft Basic, CRT monitor or TV set (color preferred). Graphics printer and paddle controls for "slides" are optional
Manufacturer: Professional Software Technology, Inc., 180 Franklin St., Cambridge, MA 02139
Price: $199
Comments: This program, according to the review, "is a graphics package designed to present a series of text or graphics 'slides' on a monitor or TV set controlled by an Apple computer."

"*Executive Briefing System*," concludes the review, "is easy to learn, easy to use, and produces professional results in a minimum amount of time."
Reader Service Number 415

(Reviewed in Small Business Computers, *January/February, 1983)*

APPLE

Menu II

System Requirements: Apple II Plus, DOS 3.3, 48K RAM, one or two disk drives, printer
Manufacturer: C & H Video, 110 West Caracas Ave., Hershey, PA 17033
Price: $39.95
Comments: "Menu II," says the review, "lets you store your favorite recipes, write daily menus for up to a two-week period and generate shopping lists from the specific ingredients that you use."

"The Menu II cannot replace *The Joy of Cooking*," concludes the review, "but it doesn't try to. . . . With it, you can take your first step toward an automated kitchen!"
Reader Service Number 411

(Reviewed in InfoWorld, *December 27, 1982)*

IBM PC

Volkswriter

System Requirements: IBM PC, PC-DOS, 64K of memory (more is recommended), one or two disk drives
Manufacturer: Lifetree Software, 177 Webster St., Monterey, CA 93940
Price: $195
Comments: Volkswriter, according to the review, is one of the best word processors in existence, especially the newest version, 1.2, which has eliminated a number of the earlier version's shortcomings. Version 1.2 is also not copy-protected, a great advantage.

Volkswriter is notable, says the review, for "ease of use, speed of performance, and file versatility. Another outstanding feature is that it works."
Reader Service Number 419

(Reviewed in PC Magazine, *November, 1982)*

IBM PC

The Instructor

System Requirements: IBM PC, 64K, one disk drive
Manufacturer: Individual Software, Inc., 24 Spinnaker Place, Redwood City, CA 94065
Price: $39.95
Comments: "*The Instructor* is the best software-format introduction to the PC around," says the review. "*The Instructor*'s use of color, sound and screen organization provides appealing and effective lessons."

According to the review, the documentation is "superb—one of the best in the business. It is very well integrated with the software."
Reader Service Number 409

(Reviewed in PC Magazine, *December, 1982)*

IBM PC

Write-On!

System Requirements: IBM PC, at least 48K RAM (64K recommended), one disk drive, any printer
Manufacturer: Datamost, 9748 Cozycroft St., Chatsworth, CA 91311
Price: $129.95
Comments: Write-On! is a word processor with a line-oriented editor. It is, according to the review, "a relatively low-cost option for people who use a word processor primarily for form letters."

"As with any word processor," says the review, "a good part of Write-On's power is in its ability to manipulate blocks of text, and the program does move, copy, delete or repeat blocks well."
Reader Service Number 420

(Reviewed in PC Magazine, *November, 1982)*

IBM PC

The Benchmark

System Requirements: IBM PC, CP/M-86, 128K of RAM, one disk drive (two disk drives and 256K of RAM improve the performance)
Manufacturer: MetaSoft Corporation, 711 East Cottonwood Lane, Ste. E, Casa Grande, AZ 85222
Price: $499
Comments: The review calls The Benchmark "great," saying it "provides almost all the conceivable tools for creating and printing paperwork." Its excellence is, however, costly, in the price both of the program and the system requirements.

For writers who need a first-class word processor, "The system has style and manners, and possesses the tools to do the job," says the review.
Reader Service Number 418

(Reviewed in PC Magazine, *November, 1982)*

IBM PC

The Word Worker

System Requirements: IBM PC, 48K (64K recommended) of RAM, PC-DOS, BASIC, four DOS disk utilities: CHKDSK, Format, Diskcopy and Command
Manufacturer: Design Enterprises of San Francisco, PO Box 14695, San Francisco, CA 94114
Price: $29.95
Comments: The review recommends that before buying The Word Worker, you buy *Write, Edit and Print*, a book by the program author, Donald H. McCunn, which does an excellent job of explaining how a word processing program works.

As to the program, "...if you're looking for an inexpensive word processor," the review concludes, "and don't mind putting up with extra keystrokes and the limitations of line editing, this program will suit you fine."
Reader Service Number 417

(Reviewed in PC Magazine, *November, 1982)*

IBM PC

ATI Power for IBM PC-DOS

System Requirements: IBM PC, 64K, one disk drive
Manufacturer: America Training International, 3800 Highland Ave., #300, Manhattan Beach, CA 90266
Price: $75
Comments: "*ATI Power*," says the review, "is designed to teach students how to use PC-DOS commands.... The program is easy to use and allows the students to select either a tutorial or a review of specific commands."

The program, according to the review, "is a good tutorial simulation of PC-DOS for the first-time user."
Reader Service Number 408

(Reviewed in PC Magazine, *December, 1982)*

IBM PC

The Millionaire

System Requirements: IBM PC, 64K RAM, one disk drive, either a monochrome or color adapter
Manufacturer: Micro-Z Applications, 22704 Ventura Blvd., Suite 141, Woodland Hills, CA 91364
Price: $49.85
Comments: "The Millionaire," says the review, "successfully captures the interest and excitement—as well as the inherent risk—of playing the stock market.... Overall, the game seems well-designed and well-thought-out."

The program, concludes the review, "is not geared to an adult market.... For kids, however, this might well be an educational game."
Reader Service Number 413

(Reviewed in SoftSide, *Vol. 6, #2)*

IBM PC

Friendly Ware—PC Introductory Set

System Requirements: IBM PC, 64K, one disk drive
Manufacturer: FriendlySoft, Inc., 213 Pebblebrook, Arlington, TX 76014
Price: $49.95
Comments: The review states that with this program "you get three disks containing three personal finance and 27 game programs and a well-prepared reference book." According to the review, the disks also contain an introduction to the PC, a vision- and hearing-test program and a personal biorhythms program.

"The games...are excellent, and the finance programs are instructive and helpful," concludes the review. "*Introductory Set*... is highly recommended and sure to please."
Reader Service Number 407

(Reviewed in PC Magazine, *December, 1982)*

IBM PC

TK! Solver

System Requirements: IBM PC, 96K main memory
Manufacturer: Software Arts, Inc., 675 Massachusetts Ave., Cambridge, MA 02139
Price: $299
Comments: "*TK! Solver* allows a microcomputer to be used flexibly to solve problems involving mathematical calculation and analysis," says the review. "The user simply types in one or more equations and the known variables. *TK! Solver* then solves for the missing variables."

"This flexible, powerful package," concludes the review, "will be a valuable tool for professionals in engineering, architecture, finance, education and general management."
Reader Service Number 414

(Reviewed in Small Business Computers, *January/February, 1983)*

IBM PC

Graphmagic

System Requirements: IBM PC, IBM Basic, minimum of 96K, one disk drive, graphics-capable printer for hard copy output
Manufacturer: International Software Marketing, Ltd., University Building #42, 120 East Washington Street, Syracuse, NY 13202
Price: $119.95
Comments: "This program takes numbers and labels...and yields precisely drawn and attractively presented pie charts, bar charts, and line graphs in high-resolution display," says the review. The right printer will also produce hard copy of high quality.

According to the review, the documentation is cumbersome, but "...this is one very impressive program for the IBM PC."
Reader Service Number 406

(Reviewed in PC Magazine, *December, 1982)*

IBM PC

Vocab Teacher

System Requirements: IBM PC, 64K, one disk drive
Manufacturer: The Moonware Company, 39 Sylvan Lane, Weston, MA 02193
Price: $25
Comments: "This program allows teachers to create their own instructional units," says the review. ". . . a teacher who has no previous experience can set 100 drill and practice sessions on various subjects."

Although Vocab Teacher lacks versatility, according to the review, at its modest cost it is a practical help in the classroom.
Reader Service Number 402

(Reviewed in PC Magazine, December, 1982*)*

IBM PC

Typing Tutor

System Requirements: IBM PC, 48K, one disk drive
Manufacturer: IBM Corp., Systems Products Division, PO Box 1328, Boca Raton, FL 33432
Price: $24.95
Comments: Emphasizing accuracy over speed, the Typing Tutor ". . . teaches the letters, numbers, and special functions of the PC keyboard," says the review. 39 students may be monitored by one teacher using this program.

The program's menu "is not very flexible," concludes the review. "It ignores the function keys. But even with this flaw, *Typing Tutor* is a useful tool for users who are new to the PC keyboard."
Reader Service Number 403

(Reviewed in PC Magazine, *December, 1982)*

IBM PC

Computer Discovery

System Requirements: IBM PC, 64K, one disk drive, color/graphics adapter
Manufacturer: Science Research Associates, 155 North Wacker Drive, Chicago, IL 60606
Price: $200
Comments: According to the review, this program's objective "is to introduce basic computer concepts, including logical analysis, programming, applications, and the history of computers." It is designed (in two versions) for junior or senior high school students.

"The program is visually appealing," says the review, "makes good use of both color and graphics, and presents the course material in imaginative, interesting ways." 20 student workbooks, a teacher's guide and two disks are included.
Reader Service Number 405

(Reviewed in PC Magazine, *December, 1982)*

IBM PC

Speed Reader

System Requirements: IBM PC, 64K, two disk drives
Manufacturer: Davidson and Associates, 6069 Groveoak Place #14, Rancho Palos Verdes, CA 90274
Price: $74.95
Comments: "*Speed Reader* teaches students to read faster and with greater comprehension," says the review. "It combines excellent graphics and sound effects to lead students through a variety of self-paced practice exercises."

Although the documentation is not sufficiently detailed, concludes the review, "*Speed Reader* is a practical program that systematically enhances reading skill."
Reader Service Number 404

(Reviewed in PC Magazine, *December, 1982)*

IBM PC

Word Challenge

System Requirements: IBM PC, 64K, one disk drive
Manufacturer: Proximity Devices Corporation, 3511 N.E. 22nd Ave., Ft. Lauderdale, FL 33308
Price: $39.95
Comments: "*Word Challenge*," states the review, "is an entertaining and effective tool for practicing word identification and spelling." The program, according to the review, "asks the user to find as many words as possible in a square with 9, 16 or 25 boxes."

Word Challenge has a large vocabulary of about 90,000 words, and, concludes the review, ". . . achieves a high level of interactivity and offers many clear examples."
Reader Service Number 401

(Reviewed in PC Magazine, *December, 1982)*

Compute!, published by Small System Services, Inc., PO Box 5406, Greensboro, NC 27403; $20 annually, 12 issues.

InfoWorld, published by Popular Computing, Inc., 375 Cochituate Road, Box 880, Framingham, MA 01701; $25 annually, 51 issues.

PC Magazine, published by Software Communications, Inc., 1528 Irving St., San Francisco, CA 94122; $24.97 annually, 12 issues.

Small Business Computers, published by Creative Computing, 39 East Hanover Ave., Morris Plains, NJ 07950; $12 annually, six issues.

Softside, 6 South St., Milford, NH 03055; $30 annually, 12 issues.

Table. Addresses and subscription prices of the magazines publishing the software reviews digested in this department.

(Note: The address for the Atari Program Exchange given in the January 1983 issue of *Microcomputing* was outdated. The correct address for APX is now 3281 Scott Blvd., Santa Clara, CA 95051.)

CALENDAR

Seattle Education Conference

The sixth annual Computers in Education Conference will be held March 18–19 on the campus of Seattle Pacific University, in Seattle, WA. The conference is designed for the elementary or secondary educator or administrator interested in the changing role of the microcomputer in education.

For more information and preregistration forms, contact Tony Jongejan, Everett High School, 2416 Colby, Everett, WA 98201; telephone 206-334-6965.

Computer Faire

Thousands of people will be jamming the 8th West Coast Computer Faire on March 18–20 in San Francisco's Brooks Hall and Civic Auditorium.

For further information, write or call Computer Faire, 345 Swett Road, Woodside, CA 94062; telephone 415-851-7077.

Oklahoma Dungeoneers

The Northern Oklahoma Dungeoneers are sponsoring a spring gaming convention, FantasyLair '83, to be held March 25–27 at the Tonkawa High School in Tonkawa, OK. There will be a tournament, a costume contest, seminars and prizes.

For more information, contact the Northern Oklahoma Dungeoneers, PO Box 241, Ponca City, OK 74602; telephone 405-762-0349.

Baltimore Computerfest

The Greater Baltimore Hamboree and Computerfest will be held March 27th at the Maryland State Fairgrounds Exhibition Complex in Timonium, MD. Exhibition and sale of software, and personal and business computers will be featured; there will be guest speakers throughout the day, and flea market spaces are available for hobbyists.

For more information, contact GBH & C, PO Box 95, Timonium, MD 21093; telephone 301-561-1282.

Color Graphics in Florida

The International Computer Color Graphics Conference is scheduled for March 10–12 at Florida State University in Tallahassee.

For information, write or call Dr. Harold B. Crosby, 314 Wescott Hall, Florida State University, Tallahassee, FL 32306; telephone 904-644-6876.

Localnet '83 (Europe)

Localnet '83 (Europe), a conference focusing on local net systems, will be held March 8–10 at the Royal Lancaster Hotel in London. (A similar conference, Localnet '83 USA, will take place in June in New York.)

For information, call Online Conferences Ltd., Northwood (09274)28211 (from the United Kingdom), or 44-9274-28211 (from the United States or Canada), or write Online at Argyle House, Northwood Hills, HA6 1TS, Middlesex, UK.

Computers in Special Education

A National Topical Conference on the Use of Microcomputers in Special Education is scheduled for March 10–12 in Hartford, Connecticut. Many aspects of the role microcomputers can play in the education of handicapped and gifted children will be addressed.

For details and preregistration and housing forms, write John Grossi, Conference Manager, The Council for Exceptional Children, Department of Field Services, 1920 Association Drive, Reston, VA 22091.

Michigan Conference on Computers in Education

The Michigan Association for Computer Users in Learning will hold its seventh annual conference on March 14–15 at the Hyatt Regency in Dearborn, MI. Over 2000 educators from the Midwest are expected to attend.

For further information, contact Betty VandenBosch Shaw, Coordinator of Mathematics, Flint Community Schools, 923 East Kearsley, Flint, MI 48502; telephone 313-762-1007.

Federal Office Systems Expo

The Seventh Annual Federal Office Systems Expo (FOSE) will be held at the new Washington Convention Center, Washington DC, March 14–17.

For more information or a copy of the conference brochure, contact Mary Beth Gouled, National Trade Productions, Inc., 9418 Annapolis Road, Lanham, MD 20706; telephone 301-459-8383 or 800-638-8510.

Education Conference in Arizona

The College of Education of Arizona State University is hosting the third annual Microcomputers in Education Conference on March 17–19 in Tempe. A variety of workshops, demonstrations and presentations will address the role of the computer in revolutionizing the teaching and learning process.

For registration materials and information, write or call Marilyn Sue Ford, B-47 Payne Hall, College of Education, Arizona State University, Tempe, AZ 85287; telephone 602-965-7363.

Productivity '83 in Philadelphia and Detroit

The Hewlett-Packard Company will present Productivity '83, featuring a wide variety of its computer systems, at Adam's Mark in Philadelphia, PA, April 6–7, and at the Michigan Inn in Detroit, MI, April 19–21.

The show is free and includes seminars and a chance for hands-on experience. For pre-registration or more information, call 800-453-9500.

1983 Eighty/Apple Show in New York

The Kengore Corporation's 1983 version of the Eighty/Apple Show will be held April 8–10 at the Statler Hotel, 7th Ave. and 33rd St., New York City.

This year the show will include the IBM Personal Computer as well as the TRS-80 and the Apple systems. For further information, contact Kengore Corp., 3001 Route 27, Franklin Park, NJ 08823; telephone 201-297-2526.

APL 83 Conference in Washington, DC

The 1983 APL Conference and Exhibition will be held in Washington, DC, April 10–13 at the Sheraton Washington Hotel. The program will include tutorials, presentation of papers by leaders in the APL field and, of course, the exhibits.

For information on exhibits or program, contact D & S Whyte Associates, 117 King St., Suite 200, Alexandria, VA 22314; telephone 703-548-4059.

Southeastcon '83 in Florida

Southeastcon '83 will take place April 11–14 in the Sheraton Twin Towers Hotel Convention Center in Orlando, Florida. The conference is sponsored by Region 3 of the Institute of Electrical and Electronics Engineers (IEEE).

For further information, contact Russell E. Theisen, Martin Marietta Aerospace, PO Box 5837 MP-3, 2667 Fitzhugh Road, Winter Park, FL 32792; telephone 305-671-4139.

Southwest Computer Conference in Oklahoma

April 12–14 are the dates for the Southwest Computer Conference, to be held at the Myriad Convention Center in Oklahoma City, OK. For more information, call 405-329-3660.

New York Computer Show

The second annual Computer Show and Software Exposition will be held April 14–17 at the Nassau Coliseum on Long Island. The show features thousands of peripheral and software items. Admission is $5 for adults.

For more information, call Northeast Expositions, 617-739-2000 or 800-841-7000.

Mini/Micro Northeast and Electro/83

The New York Coliseum will be the site of Mini/Micro Northeast and Electro/83, to be held April 19–21 under the joint sponsorship of IEEE and ERA.

For more information, call Eileen Algaze or Kent Keller, 213-772-2965 or (from outside California) 800-421-6816.

New Jersey Computer Festival

The eighth annual Trenton Computer Festival will be held at Trenton State College, just outside Trenton, NJ, on April 16–17. The Festival features many forums, user-group sessions and tutorials—as well as an exhibit and flea market—concentrating on microcomputers.

For more information, call Dr. Allen Katz, 609-771-2487.

Applefest/Anaheim

Applefest/Anaheim will be held April 15–17 at the Anaheim, California, Convention Center. It is the largest Apple-specific show in the country, and virtually all Apple-compatible products will be on display and for sale.

For more information, call Northeast Expositions, 617-739-2000 or 800-841-7000.

Southwest Computer Show in Dallas

The third annual Southwest Computer Show and Software Exposition will take place April 28–May 1 at the Dallas, TX Market Hall.

For more information, call Northeast Expositions, 617-739-2000.

CLASSIFIEDS

Classified advertisements are intended for use by persons desiring to buy, sell or trade used computer equipment. No commercial ads are accepted.

Two sizes of ads are available. The $5 box allows up to 5 lines of about 35 characters per line, including spaces and punctuation. The $10 box allows up to 10 lines. Minimize use of capital letters to save space. No special layouts allowed. Payment is required in advance with ad copy. We cannot bill or accept credit.

Advertising text and payment must reach us 60 days in advance of publication (i.e., copy for March issue, mailed in February, must be here by Jan. 1). The publisher reserves the right to refuse questionable or inapplicable advertisements. Mail copy with payment to **Classifieds, *Microcomputing*, Peterborough, NH 03458.** Do not include any other material with your ad as it may be delayed.

SWTPC SYSTEM: SMARTBUG, 48K, MP-S, CT-64, CT-VM, AC-30, TC-3 4800 baud tape interface, SSB disk system, $1800/offer; (206) 878-3629, 6-10 pm.

TIMEX/Sinclair 1000/ZX81 owners: Interested in sharing programs and ideas with others? Join the program exchange group. Send stamped envelope to: Sinclair Program Exchange, 1280 Paddington Way, San Jose, CA 95127.

CONVERSIONS

Each month Microcomputing *will publish Apple, Atari, Commodore, Heath or IBM PC translations of selected programs published in the magazine. We encourage our readers to submit a hard copy of their conversions along with a cassette or disk of the program. Include a self-addressed, stamped envelope for the return of magnetic media if not selected for publication. Authors whose translations are chosen will receive payment for their efforts.*

Program conversion of Healthful Hints from Heath (January 1983 Microcomputing, *p. 48) for the IBM PC. By Dave Phillips, 7096 Grape St., Commerce City, CO 80022.*

```
10 KEY OFF                              'turns off key display
20 'This program is intended to provide a guide to heart disease risk.
30 'It is only a guide. Consult you physician for mor information.
40 'Written in Microsoft Basic by D. C. Shoemaker for the H19/H89.
50 'Modified for the IBM-PC by Dave Phillips (Jan. 1, 1983)
60 'Program was published in the January 1983 issue of Microcomputing.
70 '
80 CLS                                   'clear IBM-PC screen
90 '
100 PRINT,"This program will help you assess your present risk of heart disease.
"
110 PRINT"It is a guide only; for more exact information, you should consult"
120 PRINT"your physician.":PRINT
130 PRINT"To use the program, just answer the questions as presented."
140 PRINT
150 PRINT"First age. Choose from the following age groups:":PRINT
160 PRINT"  1 - Ten to twenty years old."
170 PRINT"  2 - Twenty one to thirty years old."
180 PRINT"  3 - Thirty one to forty years old."
190 PRINT"  4 - Forty one to to fifty years old."
200 PRINT"  5 - Fifty one to sixty years old."
210 PRINT"  6 - Sixty one and over.":PRINT
220 PRINT:INPUT"What is your age group(1-6)";A
230 IF A<1 OR A>6 THEN 140
240 IF A=5 THEN A=A+1
250 IF A=6 THEN A=A+2
260 CLS                                 'clear IBM-PC scerrn
270 PRINT"Next is the heredity factor. Select from the following:":PRINT
280 PRINT"  1 - No known history of heart disease in the family."
290 PRINT"  2 - One relative with cardiovascular disease, over sixty."
300 PRINT"  3 - Two relatives with cardiovascular disease, over sixty."
310 PRINT"  4 - One relative with cardiovascular disease, under sixty."
320 PRINT"  5 - Two relatives with cardiovascular disease, under sixty."
330 PRINT"  6 - Three relatives with cardiovascular disease, under sixty."
340 PRINT :INPUT"What category (1-6)";H
350 IF H<1 OR H>6 THEN 260
360 IF H=5 THEN H=H+1
370 IF H=6 THEN H=H+1
380 PRINT:PRINT
390 PRINT"Now for your weight. Choose from the following:":PRINT
400 PRINT"  1 - More than 5 pounds under the standard weight"
410 PRINT"      for your height."
420 PRINT"  2 - Between -5 and +5 pounds of the standard."
430 PRINT"  3 - 6 to 20 pounds overweight."
440 PRINT"  4 - 21 to 35 pounds overweight."
450 PRINT"  5 - 36 to 50 pounds overweight."
460 PRINT"  6 - More than 51 pounds overweight.":PRINT
470 PRINT:INPUT"Which weight category (1-6)";W
480 IF W<1 OR W>6 THEN 380
490 W=W1
500 IF W=4 THEN W=W+2
510 IF W=5 THEN W=W+2
520 CLS                                 'clear IBM-PC screen
530 PRINT"Smoking habits are next. Select from the following groups:":PRINT
540 PRINT"  1 - Non-smoker."
550 PRINT"  2 - Cigar and/or pipe."
560 PRINT"  3 - 10 or fewer cigarettes per day."
570 PRINT"  4 - 20 cigarettes a day."
580 PRINT"  5 - 30 cigarettes a day."
590 PRINT"  6 - 40 or more cigarettes a day.":PRINT
600 PRINT:INPUT"What is your smoking category (1-6)";T
610 IF T<1 OR T>6 THEN 520
620 T=T+1
630 IF T=3 THEN T=T+1
640 IF T=4 THEN T=T+2
650 IF T=5 THEN T=T+5
660 PRINT:PRINT
670 PRINT"Now for your exercise patterns. Choose from:":PRINT
680 PRINT"  1 - Intensive occupational and recreational exertion."
690 PRINT"  2 - Moderate occupational and recreational exercise."
700 PRINT"  3 - Sedentary work, and intense recreational exercise."
710 PRINT"  4 - Sedentary occupational and moderate recreational exercise."
720 PRINT"  5 - Sedentary work and light recreational exercise."
730 PRINT"  6 - Complete lack of all exercise.":PRINT
740 PRINT:INPUT"Which exercise category (1-6)";E
750 IF E<1 OR E>6 THEN 660
760 IF E=4 THEN E=E+1
770 IF E=5 THEN E=E+1
780 IF E=6 THEN E=E+2
790 CLS                                 'clear IBM-PC screen
800 PRINT"The amount of cholesterol or fat per cent in your diet is next."
810 PRINT"You may choose from the following:":PRINT
820 PRINT"  1 - Cholesterol below 180 mg.%; diet contains no animal"
830 PRINT"      or solid fats."
840 PRINT"  2 - Cholesterol 181-205 mg.%; diet contains 10% animal"
850 PRINT"      or solid fats."
860 PRINT"  3 - Cholesterol 206-230 mg.%; diet contains 20% animal"
870 PRINT"      or solid fats."
880 PRINT"  4 - cholesterol 231-255 mg.%; diet contains 30% animal"
890 PRINT"      or solid fats."
900 PRINT"  5 - Cholesterol 256-280 mg.%; diet contains 40% animal"
910 PRINT"      or solid fats."
920 PRINT"  6 - Cholesterol 281-300 mg.%; diet contains 50% animal"
930 PRINT"      or solid fats.":PRINT
940 PRINT:INPUT"What category (1-6)";C
950 IF C<1 OR C>6 THEN 790
960 IF C=6 THEN C=C+1
970 CLS                                 'CLEAR IBM-PC SCREEN
980 PRINT"Now for your blood pressure. Select from the following:":PRINT
990 PRINT"  1 - Upper reading of 100."
1000 PRINT"  2 - Upper reading of 120."
1010 PRINT"  3 - Upper reading of 140."
```

More

Listing continued

```
1020 PRINT"  4 - Upper reading of 160."
1030 PRINT"  5 - Upper reading of 180."
1040 PRINT"  6 - Upper reading of 200 or over.":PRINT
1050 PRINT:INPUT"Which category (1-6)";P
1060 IF P<1 OR P>6 THEN 970
1070 IF P=5 THEN P=P+1
1080 IF P=6 THEN P=P+2
1090 PRINT:PRINT
1100 PRINT"Finally, your sex. Choose from the following:":PRINT
1110 PRINT" 1 - Female under age 40."
1120 PRINT" 2 - Female of age 40 to 50."
1130 PRINT" 3 - Female over 50."
1140 PRINT" 4 - Male."
1150 PRINT" 5 - Stocky male."
1160 PRINT" 6 - Bald, stocky male.":PRINT
1170 PRINT:INPUT"And your category (1-6)";S
1180 IF S=4 THEN S=S+1
1190 IF S=5 THEN S=S+1
1200 IF S=6 THEN S=S+1
1210 '
1220 'Tally the factors
1230 '
1240 GT=A+H+W+T+E+C+P+S
1250 CLS                                'clear IBM-PC screen
1260 PRINT"Results of this short quiz suggest that, based on your"
1270 PRINT"answers to the question, in light of currently accepted"
1280 PRINT"standards, your risk of suffering a heart attack is"
1290 '
1300 'Determine the appropriate response
1310 '
1320 IF GT>40 THEN 1380
1330 IF GT>31 THEN 1400
1340 IF GT>24 THEN 1410
1350 IF GT>17 THEN 1420
1360 IF GT>11 THEN 1430
1370 GOTO 1440
1380 PRINT"at a dangerous and urgent level. You should see your"
1390 PRINT"physician now.":GOTO 1450
1400 PRINT"at a dangerous level.":GOTO 1450
1410 PRINT"moderate.":GOTO 1450
1420 PRINT"generally below average.":GOTO 1450
1430 PRINT"below average.":GOTO 1450
1440 PRINT"well below average."
1450 PRINT:PRINT
1460 PRINT"You should bear in mind that this simple analysis of your risk"
1470 PRINT"factors reflect medical conditions and habits associated with"
1480 PRINT"an increased danger of heart attack. It neither means that you"
1490 PRINT"will or won't suffer one, but merely suggests potentials. Not"
1500 PRINT"all factors can be quantified this simply and easily.":PRINT
1510 PRINT"You should be guided in this, as in all matters of health, by"
1520 PRINT"competent medical advice. This computer program is not a"
1530 PRINT"substitute for that.
1540 END
```

Healthful Hints program modified to run on the Atari. By Philip Kreiker, Looking Glass Microproducts, PO Box 5084, Loveland, CO 80537.

```
10 REM This program is intended to provide a guide to heart disease risk.
20 REM It is only a guide.  Consult your physician for more exact
   information.
30 REM Writtten in Microsoft BASIC by D.C. Shoemaker
31 REM
32 REM ATARI version by Philip M. Kreiker
33 REM
34 REM
40 REM
50 GRAPHICS 0:
   POKE 752,1:
   POKE 201,5
60 REM
70 PRINT "This program will help you assess your";
75 PRINT "present risk of heart disease."
80 PRINT
85 PRINT "It is a guide only; for more"
90 PRINT "information, consult your physician."
95 PRINT
100 PRINT "To use the program, just answer the":
    PRINT "questions as they are presented."
110 PRINT
120 PRINT "First, your age.":
    PRINT
125 PRINT "Please choose from one of the ":
    PRINT "following age groups:":
    PRINT
130 PRINT ,"A -- 10 to 20 years old"
140 PRINT ,"B -- 21 to 30"
150 PRINT ,"C -- 31 to 40"
160 PRINT ,"D -- 41 to 50"
170 PRINT ,"E -- 51 to 60"
180 PRINT ,"F -- 61 and over"
190 GOSUB 2000
200 A=KEYNUM+(KEYNUM=5)+2*(KEYNUM=6)
230 PRINT CHR$(125)
240 PRINT "Next is the hereditary factor.":
    PRINT
245 PRINT "Please select from one of the":
    PRINT "following groups:":
    PRINT
250 PRINT ,"A -- No known history of heart":
    PRINT ,"      disease in your family."
260 PRINT ,"B -- One relative over 60 with":
    PRINT ,"      heart disease."
270 PRINT ,"C -- Two relatives over 60 with":
    PRINT ,"      heart disease."
280 PRINT ,"D -- One relative under 60 with":
    PRINT ,"      heart disease."
290 PRINT ,"E -- Two relatives under 60 with":
    PRINT ,"      heart disease."
300 PRINT ,"F -- Three relatives under 60":
    PRINT ,"      with heart disease."
310 GOSUB 2000
320 H=KEYNUM+(KEYNUM=5)+(KEYNUM=6)
```

More

Listing continued

```
350 PRINT CHR$(125)
360 PRINT "Now for your weight":
    PRINT
365 PRINT "Please choose one of the following:":
    PRINT
370 PRINT ,"A -- more than 5 lbs. under the":
    PRINT ,"     standard weight for your":
    PRINT ,"     height."
380 PRINT ,"B -- within 5 lbs. of the":
    PRINT ,"     standard."
390 PRINT ,"C --  6 to 12 lbs. overweight."
400 PRINT ,"D -- 21 to 35 lbs. overweight."
410 PRINT ,"E -- 36 to 50 lbs. overweight."
420 PRINT ,"F -- 51+      lbs. overweight."
430 GOSUB 2000
440 W=KEYNUM-1+2*(KEYNUM=5)+2*(KEYNUM=6)
490 PRINT CHR$(125)
500 PRINT "Smoking habits are next.":
    PRINT
505 PRINT "Please select one of the following":
    PRINT "groups:  ":
    PRINT
510 PRINT ,"A -- non-smoker"
520 PRINT ,"B -- cigar and/or pipe"
530 PRINT ,"C -- 10 or less cigarettes/day"
540 PRINT ,"D -- 20 cigarettes/day"
550 PRINT ,"E -- 30 cigarettes/day"
560 PRINT ,"F -- 40 or more cigarettes/day"
570 GOSUB 2000
590 T=KEYNUM-1+(KEYNUM=4)+2*(KEYNUM=5)+5*(KEYNUM=6)
630 PRINT CHR$(125)
640 PRINT "Now for your exercise pattern.":
    PRINT :
    PRINT "Please choose one of the following:":
    PRINT
650 PRINT ,"A -- intensive occupational and":
    PRINT ,"     recreational exercise"
660 PRINT ,"B -- moderate occupational and":
    PRINT ,"     recreational exercise"
670 PRINT ,"C -- sedentary work and intense":
    PRINT ,"     recreational exercise"
680 PRINT ,"D -- sedentary work and moderate":
    PRINT ,"     recreational exercise"
690 PRINT ,"E -- sedentary work and light":
    PRINT ,"     recreational exercise"
700 PRINT ,"F -- complete lack of exercise"
710 GOSUB 2000
740 E=KEYNUM+(KEYNUM=4)+(KEYNUM=5)+2*KEYNUM=6
770 PRINT CHR$(125)
780 PRINT "The amount of cholesterol or fat in":
    PRINT "your diet is next.":
    PRINT
790 PRINT "You may choose one of the following:":
    PRINT
800 PRINT ,"A --   0-180 mg. cholersterol":
    PRINT ,"     no animal or solid fats"
810 PRINT ,"B -- 181-205 mg cholerterol.":
    PRINT ,"     10% animal or solid fats"
820 PRINT ,"C -- 206-230 mg. cholesterol":
    PRINT ,"     20% animal or solid fats"
830 PRINT ,"D -- 231-255 mg. cholesterol":
```

More

Listing continued

```
    PRINT ,"     30% animal or solid fats"
840 PRINT ,"E -- 256-280 mg. cholesterol":
    PRINT ,"     40% animal or solid fats"
850 PRINT ,"F -- 281-300 mg. cholesterol":
    PRINT ,"     50% animal or solid fats"
930 GOSUB 2000
940 C=KEYNUM+(KEYNUM=6)
950 PRINT CHR$(125)
960 PRINT "Now for your blood pressure.":
    PRINT
965 PRINT "Please select from the following:":
    PRINT
970 PRINT ,"A -- 100 upper reading"
980 PRINT ,"B -- 120 upper reading"
990 PRINT ,"C -- 140 upper reading"
1000 PRINT ,"D -- 160 upper reading"
1010 PRINT ,"E -- 180 upper reading"
1020 PRINT ,"F -- 200+ upper reading"
1025 GOSUB 2000
1030 P=KEYNUM+(KEYNUM=5)+2*(KEYNUM=6)
1070 PRINT CHR$(125)
1080 PRINT "Finally, your sex and age.":
     PRINT
1085 PRINT "Please enter one of the following:":
     PRINT
1090 PRINT ,"A -- Female under 40"
1100 PRINT ,"B -- Female   40-50"
1110 PRINT ,"C -- Female  over 50"
1120 PRINT ,"D -- Male"
1130 PRINT ,"E -- Male, stocky"
1140 PRINT ,"F -- Male, bald and stocky"
1150 GOSUB 2000
1160 S=KEYNUM+(S)=4)
1200 REM Tally the factors
1210 REM
1220 GT=A+H+W+T+E+P+S
1230 PRINT CHR$(125);
1240 PRINT "Results of this short quiz suggest":
     PRINT "that, based on your answers to"
1250 PRINT "the questions, in light of currently":
     PRINT "accepted standards, your risk of"
1260 PRINT "suffering a heart attack is"
1270 IF (GT)31) AND (GT(=41) THEN PRINT "at a dangerous level."
1280 IF (GT)24) AND (GT(=31) THEN PRINT "moderate."
1290 IF (GT)17) AND (GT(=24) THEN PRINT "generally below average."
1300 IF (GT)11) AND (GT(=17) THEN PRINT "below average."
1310 IF GT(=11 THEN PRINT "well below average."
1315 PRINT
1440 PRINT "You should bear in mind that this":
     PRINT "simple analysis of your risk factors"
1450 PRINT "reflect medical conditions and habits":
     PRINT "associated with an increased danger"
1460 PRINT "of heart attack.  It neither means":
     PRINT "that you will or won't suffer one,"
1470 PRINT "but merely suggests potentials.  Not"
1480 PRINT "all factors can be quantified this":
     PRINT "simply and easily.":
     PRINT
1490 PRINT "You should be quiged in this, as in":
     PRINT "all matters of health, by competent"
1500 PRINT "medical advice.  This computer":
```

More

Listing continued

```
      PRINT "program is not a substiute for that."
 1510 POKE 752,0
 1520 END
 1530 GOTO 50
 2000 REM Wait for Keypress
 2010 KEY=PEEK(764):
      IF KEY=255 THEN 2010
 2020 SOUND 0,64,10,15:
      FOR DELAY=1 TO 3:
      NEXT DELAY:
      SOUND 0,0,0,0
 2030 POKE 764,255
 2040 KEYNUM=(KEY=63)+2*(KEY=21)+3*(KEY=18)+4*(KEY=58)+5*(KEY=42)+6*(KEY=56)
 2050 IF KEYNUM=0 THEN 2010
 2060 RETURN
```

Dale Duckworth's (202 Yale St., Tullahoma, TN 37388) program conversion of the Healthful Hints program written in Applesoft Basic.

```
  10  REM THIS PROGRAM IS INTENDED TO PROVIDE
  15  REM A GUIDE TO HEART DISEASE RISK.
  20  REM IT IS ONLY A GUIDE.  CONSULT YOUR
  25  REM PHYSICIAN FOR MORE EXACT INFORMATION.
  30  REM WRITTEN IN MICROSOFT BASIC BY D.C. SHOEMAKER.
  35  REM PUBLISHED IN MICROCOMPUTING, JANUARY, 1983.
  40  REM CONVERTED TO APPLESOFT BASIC BY D.L. DUCKWORTH.
  45  REM
  50  HOME : REM CLEAR THE APPLE MONITOR SCREEN
  60  REM
  65  PRINT "     HEART DISEASE RISK GUIDE": PRINT
  70  PRINT "THIS PROGRAM WILL HELP YOU ASSESS"
  75  PRINT "YOUR PRESENT RISK OF HEART DISEASE."
  80  PRINT "IT IS A GUIDE ONLY; FOR MORE EXACT"
  85  PRINT "INFORMATION YOU SHOULD CONSULT YOUR"
  90  PRINT "PHYSICIAN.": PRINT
 100  PRINT "TO USE THE PROGRAM, JUST ANSWER THE"
 105  PRINT "QUESTIONS AS PRESENTED."
 110  PRINT
 120  PRINT "FIRST, YOUR AGE.  CHOOSE FROM THE"
 125  PRINT "FOLLOWING AGE GROUPS:": PRINT
 130  PRINT "  1 - TEN TO TWENTY YEARS OLD"
 140  PRINT "  2 - TWENTY-ONE TO THIRTY YEARS OLD"
```

More →

Listing continued

```
 150  PRINT "  3 - THIRTY-ONE TO FORTY YEARS OLD"
 160  PRINT "  4 - FORTY-ONE TO FIFTY YEARS OLD"
 170  PRINT "  5 - FIFTY-ONE TO SIXTY YEARS OLD"
 180  PRINT "  6 - SIXTY-ONE AND OVER": PRINT
 190  INPUT "WHAT IS YOUR AGE CATEGORY (1-6): ";A
 200  IF A < 1 OR A > 6 THEN  GOTO 50
 210  IF A = 5 THEN  LET A = A + 1
 220  IF A = 6 THEN  LET A = A + 2
 230  HOME
 240  PRINT "NEXT IS THE HEREDITY FACTOR.  SELECT"
 245  PRINT "FROM THE FOLLOWING:": PRINT
 250  PRINT "  1 - NO KNOWN HISTORY OF HEART"
 255  PRINT "      DISEASE IN THE FAMILY"
 260  PRINT "  2 - ONE RELATIVE WITH HEART"
 265  PRINT "      DISEASE, OVER SIXTY"
 270  PRINT "  3 - TWO RELATIVES WITH HEART"
 275  PRINT "      DISEASE, OVER SIXTY"
 280  PRINT "  4 - ONE RELATIVE WITH HEART"
 285  PRINT "      DISEASE, UNDER SIXTY"
 290  PRINT "  5 - TWO RELATIVES WITH HEART"
 295  PRINT "      DISEASE, UNDER SIXTY"
 300  PRINT "  6 - THREE RELATIVES WITH HEART"
 305  PRINT "      DISEASE, UNDER SIXTY": PRINT
 310  INPUT "WHAT CATEGORY (1-6): ";H
 320  IF H < 1 OR H > 6 THEN  GOTO 230
 330  IF H = 5 THEN  LET H = H + 1
 340  IF H = 6 THEN  LET H = H + 1
 350  HOME
 360  PRINT "NOW FOR YOUR WEIGHT.  CHOOSE FROM THE"
 365  PRINT "FOLLOWING:": PRINT
 370  PRINT "  1 - MORE THAN 5 POUNDS UNDER THE"
 380  PRINT "      STANDARD WEIGHT FOR YOUR HEIGHT"
 390  PRINT "  2 - BETWEEN -5 AND +5 POUNDS OF"
 395  PRINT "      THE STANDARD"
 400  PRINT "  3 - 6 TO 20 POUNDS OVERWEIGHT"
 410  PRINT "  4 - 21 TO 35 POUNDS OVERWEIGHT"
 420  PRINT "  5 - 36 TO 50 POUNDS OVERWEIGHT"
 430  PRINT "  6 - MORE THAN 50 POUNDS OVERWEIGHT": PRINT
 440  INPUT "WHICH CATEGORY (1-6): ";W
 450  IF W < 1 OR W > 6 THEN 350
 460  LET W = W - 1
 470  IF W = 4 THEN  LET W = W + 2
 480  IF W = 5 THEN  LET W = W + 2
 490  HOME
 500  PRINT "SMOKING HABITS ARE NEXT.  SELECT FROM"
 505  PRINT "THE FOLLOWING GROUPS:": PRINT
 510  PRINT "  1 - NON-SMOKER"
 520  PRINT "  2 - CIGAR AND/OR PIPE"
 530  PRINT "  3 - 10 OR FEWER CIGARETTES PER DAY"
```

More →

Listing continued

```
540  PRINT "   4 - 20 CIGARETTES A DAY"
550  PRINT "   5 - 30 CIGARETTES A DAY"
560  PRINT "   6 - 40 OR MORE CIGARETTES A DAY": PRINT
570  INPUT "WHAT IS YOUR CATEGORY (1-6): ";T
580  IF T < 1 OR T > 6 THEN  GOTO 490
590  LET T = T - 1
600  IF T = 3 THEN  LET T = T + 1
610  IF T = 4 THEN  LET T = T + 2
620  IF T = 5 THEN  LET T = T + 5
630  HOME
640  PRINT "NOW FOR YOUR EXERCISE PATTERNS."
645  PRINT "CHOOSE FROM:": PRINT
650  PRINT "   1 - INTENSIVE OCCUPATIONAL AND"
655  PRINT "       RECREATIONAL EXERTION"
660  PRINT "   2 - MODERATE OCCUPATIONAL AND"
665  PRINT "       RECREATIONAL EXERCISE"
670  PRINT "   3 - SEDENTARY WORK AND INTENSE"
675  PRINT "       RECREATIONAL EXERCISE"
680  PRINT "   4 - SEDENTARY OCCUPATIONAL AND"
690  PRINT "       MODERATE RECREATIONAL EXERCISE"
700  PRINT "   5 - SEDENTARY WORK AND LIGHT"
705  PRINT "       RECREATIONAL EXERCISE"
710  PRINT "   6 - COMPLETE LACK OF ALL EXERCISE": PRINT
720  INPUT "WHICH CATEGORY (1-6): ";E
730  IF E < 1 OR E > 6 THEN  GOTO 630
740  IF E = 4 THEN  LET E = E + 1
750  IF E = 5 THEN  LET E = E + 1
760  IF E = 6 THEN  LET E = E + 2
770  HOME
780  PRINT "THE AMOUNT OF CHOLESTEROL OR FAT"
785  PRINT "PERCENT IN YOUR DIET IS NEXT."
790  PRINT "CHOOSE FROM THE FOLLOWING:": PRINT
800  PRINT "   1 - CHOLESTEROL BELOW 180 MG.%; DIET"
810  PRINT "       CONTAINS NO ANIMAL OR SOLID FATS"
820  PRINT "   2 - CHOLESTEROL 181-205 MG.%; DIET"
830  PRINT "       CONTAINS 10% ANIMAL OR SOLID FATS"
840  PRINT "   3 - CHOLESTEROL 206-230 MG.%; DIET"
850  PRINT "       CONTAINS 20% ANIMAL OR SOLID FATS"
860  PRINT "   4 - CHOLESTEROL 231-255 MG.%; DIET"
870  PRINT "       CONTAINS 30% ANIMAL OR SOLID FATS"
880  PRINT "   5 - CHOLESTEROL 256-280 MG.%; DIET"
890  PRINT "       CONTAINS 40% ANIMAL OR SOLID FATS"
900  PRINT "   6 - CHOLESTEROL 281-300 MG.%; DIET"
910  PRINT "       CONTAINS 50% ANIMAL OR SOLID FATS": PRINT
920  INPUT "WHAT CATEGORY (1-6): ";C
930  IF C < 1 OR C > 6 THEN  GOTO 770
940  IF C = 6 THEN  LET C = C + 1
950  HOME
960  PRINT "NOW FOR YOUR BLOOD PRESSURE.  SELECT"
965  PRINT "FROM THE FOLLOWING:": PRINT
970  PRINT "   1 - UPPER READING OF 100"
980  PRINT "   2 - UPPER READING OF 120"
990  PRINT "   3 - UPPER READING OF 140"
1000  PRINT "   4 - UPPER READING OF 160"
1010  PRINT "   5 - UPPER READING OF 180"
1020  PRINT "   6 - UPPER READING OF 200 OR OVER": PRINT
1030  INPUT "WHICH CATEGORY (1-6): ";P
1040  IF P < 1 OR P > 6 THEN  GOTO 950
1050  IF P = 5 THEN  LET P = P + 1
1060  IF P = 6 THEN  LET P = P + 2
1070  HOME
1080  PRINT "FINALLY, YOUR SEX.  CHOOSE FROM THE"
1085  PRINT "FOLLOWING:": PRINT
1090  PRINT "   1 - FEMALE UNDER AGE 40"
1100  PRINT "   2 - FEMALE OF AGE 40 TO 50"
1110  PRINT "   3 - FEMALE OVER 50"
1120  PRINT "   4 - MALE"
1130  PRINT "   5 - STOCKY MALE"
1140  PRINT "   6 - BALD, STOCKY MALE": PRINT
1150  INPUT "INDICATE YOUR CATEGORY(1-6): ";S
1155  IF S < 1 OR S > 6 THEN  GOTO 1070
1160  IF S = 4 THEN  LET S = S + 1
1170  IF S = 5 THEN  LET S = S + 1
1180  IF S = 6 THEN  LET S = S + 1
1190  REM
1200  REM TALLY THE FACTORS
1210  REM
1220  LET GT = A + H + W + T + E + C + P + S
1230  HOME
1240  PRINT "RESULTS OF THIS SHORT QUIZ SUGGEST"
1245  PRINT "THAT, BASED ON YOUR ANSWERS TO THESE"
1250  PRINT "QUESTIONS, IN LIGHT OF CURRENTLY"
1255  PRINT "ACCEPTED STANDARDS, YOUR RISK OF"
1260  PRINT "SUFFERING A HEART ATTACK IS "
1270  REM
1280  REM DETERMINE THE APPROPRIATE RESPONSE
1290  REM
1300  IF GT > 40 THEN  GOTO 1360
1310  IF GT > 31 THEN  GOTO 1380
1320  IF GT > 24 THEN  GOTO 1390
1330  IF GT > 17 THEN  GOTO 1400
1340  IF GT > 11 THEN  GOTO 1410
1350  GOTO 1420
1360  PRINT "AT A DANGEROUS AND URGENT LEVEL.  YOU"
1370  PRINT "SHOULD SEE YOUR PHYSICIAN NOW.": GOTO 1430
1380  PRINT "AT A DANGEROUS LEVEL.": GOTO 1430
1390  PRINT "MODERATE.": GOTO 1430
1400  PRINT "GENERALLY BELOW AVERAGE.": GOTO 1430
1410  PRINT "BELOW AVERAGE.": GOTO 1430
1420  PRINT "WELL BELOW AVERAGE."
1430  PRINT : PRINT
1440  PRINT "YOU SHOULD BEAR IN MIND THAT THIS"
1445  PRINT "SIMPLE ANALYSIS OF YOUR RISK FACTORS"
1450  PRINT "REFLECTS MEDICAL CONDITIONS AND HABITS"
1455  PRINT "ASSOCIATED WITH AN INCREASED DANGER"
1460  PRINT "OF HEART ATTACK.  IT DOESN'T MEAN"
1465  PRINT "THAT YOU WILL OR WON'T SUFFER ONE,"
1470  PRINT "BUT MERELY SUGGESTS POTENTIALS."
1480  PRINT "NOT ALL FACTORS CAN BE QUANTIFIED"
1485  PRINT "THIS SIMPLY AND EASILY.": PRINT
1490  PRINT "YOU SHOULD BE GUIDED IN THIS, AS IN"
1495  PRINT "ALL MATTERS OF HEALTH, BY COMPETENT"
1500  PRINT "MEDICAL ADVICE.  THIS COMPUTER PROGRAM"
1510  PRINT "IS NOT A SUBSTITUTE FOR THAT."
1520  END
```

More →

IBM PC conversion of the label-writing program in the December 1982 issue of Microcomputing *(p. 100). By Jurgen Schmidt, 702 W. Olmos, San Antonio, TX 78212.*

```
100     'PROGRAM FOR PRINTING DISK DIRECTORY
110     'ON LABELS FOR THE  IBM-PC
120     '    BY  JURGEN G. SCHMIDT
130     '        SAN ANTONIO, TX
140     '        DECEMBER 1982
150     ' Requires 3 1/2 X 15/16 inch labels
160 '
170 CLEAR : CLS        'Reset Variables, Prepare screen
180 DIM FIL$(100)      'Set up array for file names
190 FILES              'Display directory
200 '
210 'R = row pointer            C = colum pointer
220 'I = colum index pointer    F = file pointer
230 R=1 : I=1 : F=1             'Initialize pointers
240 FOR C=I TO I+12             'Loop to get 12 characters (1 filename)
250   A=SCREEN(R,C)             'Get character from screen as ascii code
260   A$=CHR$(A)                'Convert code to character
270   FIL$(F)=FIL$(F)+A$        'Build filename
280   IF C=I AND A$=" " THEN 360  'Check if first character is a blank
290 NEXT                          'If it is, then end of directory found
300 '
310 I=I+13 : F=F+1              'Increment file pointer and index
320 IF I>78 THEN GOTO 340       'Check if last filename in row
330 GOTO 240                    'Next filename
340 R=R+1 : I=1                 'Next row, reset index
350 GOTO 240                    'Next filename
360 '
380 PRINT : PRINT : PRINT "          SET UP PRINTER
390 PRINT : PRINT "     HIT SPACE BAR WHEN READY" : PRINT
400 IF INKEY$<>" " THEN 400
410 '
420 LPRINT CHR$(15);            'Set coepressed print
430 LPRINT CHR$(27)"0";         'Set to 8 lines per inch
450                             'Print line-up
460 '
470 LPRINT "L                    TOP  OF  LABEL                    R"
480 LPRINT "L                                                      R"
490 LPRINT "L                                                      R"
500 LPRINT "L                                                      R"
510 LPRINT "L                                                      R"
520 LPRINT "L                 BOTTOM  OF  LABEL                    R"
530 LPRINT : LPRINT
540 '
550 PRINT : PRINT "     IF LINE-UP IS CORRECT, HIT SPACE BAR"
560 PRINT : PRINT "      OTHERWISE HIT THE 'R' KEY TO RETRY"
570 PRINT : PRINT
580 B$=INKEY$ : IF B$="R" OR B$="r" THEN GOTO 470  ELSE IF B$=" " THEN 600
590 GOTO 580
600 I=1                         'Print the labels
610 L=1
620     LPRINT FIL$(I) TAB(16) FIL$(I+1) TAB(31) FIL$(I+2) TAB(46) FIL$(I+3)
630     L=L+1 : IF L>6 THEN 650 ELSE 640
640 I=I+4 : IF I > F+4 THEN 670 ELSE GOTO 620
650 LPRINT : LPRINT : I=I+4 : GOTO 610  'Skip two lines and start next label
660 '
670 FOR K=L TO 8 : LPRINT : NEXT        'space to top of next label
680 CLS
690 LOCATE 4,10 : PRINT "DO YOU WANT LABELS FOR ANOTHER DISK"
700 LOCATE 6,10 : INPUT"           'Y' or 'N'";Y$
710 IF Y$="Y" OR Y$="y" THEN 720 ELSE 740
720 LOCATE 10,10 : PRINT "INSERT NEW DISK AND HIT SPACE BAR WHEN READY"
730 A$=INKEY$ : IF A$=" " THEN 170 ELSE 730
740 PRINT"END" : END
```

BOOK REVIEWS

Edited by Larry Canale

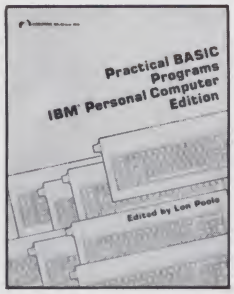
Practical Programs for IBM Users
Assembly Language in Plain English
Project-Packed PET Guide
Blowing the Lid Off Hi-Tech

Practical Basic Programs: IBM Personal Computer Edition

Edited by Lon Poole
Osborne/McGraw-Hill, 1982
630 Bancroft Way
Berkeley, CA 94710
Softcover, $15.99, 170 pp.

Practical is a funny word. In strict usage, it means of high—and perhaps immediate—applicability to your practice. When you're lost in the Adventurer's cave in a computer game, a bird, a rod or even a trident may be practical. When you're doing your taxes, or learning Basic programming, quite another set of tools may be useful.

Whether *Practical Basic Programs (PBC)* will be practical for you depends on your situation and what you need to do.



Practical Basic Programs contains 40 Basic programs relating to the areas of finance, management decision-making, statistics and mathematics/science applications. Each program is supplied with a brief description of its function, the necessary input and relevant output and an example of the program in use.

In addition, a "Program Notes" section is supplied with each program and can help the user make minor modifications (such as the enlarging of data arrays) to the listings provided. And, programs are supplied with references that can tell you more about the applications they mechanize.

In the finance area are such programs as Income Averaging (tax applications), the current value of a treasury bill, a program that computes the accrued interest on bonds and a simple checkbook reconciliation program.

The management science applications range from a simple program for calculating the relative advantages of leasing vs buying a piece of equipment, to some relatively advanced applications in operations research and queuing theory (the Swedish Machine algorithm).

Other programs cover internal rate-of-return computations and profit-sharing, and yet another program helps analyze corporate financial reports to provide financial ratios.

Statistics programs include Bayesian decision analysis, a program to compute means and moments, chi-square and others. General math/science applications include programs to do Newtonian as well as Lagrange interpolation of the area under a curve, temperature and number base conversions and even a musical transposition program.

While it is possible to categorize the programs in several different ways, my count shows 18 finance or finance-related management decision-making programs, 15 that might be called statistical or operations research in origin and seven general math/science programs.

Although sample problems are provided to illustrate the use of the programs, and although sample runs are shown, the editor makes little effort to teach the reader how to use any of the techniques illustrated by the coding. For some applications, like home budgeting, little instruction is necessary. For others, such as how to allocate three repairmen across 100 washing machines in a laundromat so that informative cash flows are generated and mean down times are available, the reader's sophistication is assumed.

Thus, the fraction of these programs that are "practical" depends on what the buyer does. The manager or management student would find the most practical applications, and the scientist or engineer would also find a great many pertinent applications. But the average hobbyist/programmer would probably find only a few.

There is, of course, another sense of the word "practical." The back cover of the book makes much of the fact that, at the retail price, the programs cost less than 50 cents each (assuming the reader puts no value on his time, of course). The programs, then, might be useful as clever illustrations of how to write Basic code for the IBM PC, a kind of tutorial.

Unfortunately, that is not the case. While the programs themselves are well-done, they are "conversions" to the IBM PC rather than programs that were written from scratch to use that machine's capabilities. No use is made of special PC function keys, nor do any of the programs incorporate graphics displays. Thus, the coding, while competent, has little to offer the student programmer by way of tutorial value.

PBC is a competently-done set of largely unrelated applications in Basic coding, converted to run on the IBM PC. The editor has taken pains to include sample runs, notes and references.

One wishes, however, that the editor had taken more pains to customize the applications he programmed in a way that novice programmers could learn about their machines (regardless of the topics covered). And, having done this, the editor would have done well to choose applications more coherently for the managers (or engineers, or scientists, or homeowners—but not all of these) that he was most interested in addressing.

Thomas V. Bonoma
Concord, MA

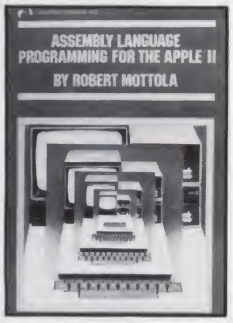
Assembly Language Programming for the Apple II

Robert Mattola
Osborne/McGraw-Hill, 1982
630 Bancroft Way
Berkeley, CA 94710
Paperback, 143 pp. $12.95

Assembly Language Programming for the Apple II is clear, conversational and interesting—which may be a first among books aimed at teaching assembler languages. Furthermore, the size is right (143 pages) and the price is right ($12.95).

Author Robert Mattola set out to teach Apple users who have a knowledge of Basic how to program the machine in assembler. It's not difficult if you take these steps:

1. Get a LISA assembler. (Refer to page 7 of *Assembly Language Programming for the Apple II* for the other requirements.)
2. Load the assembler into the machine.
3. Read pages 1 through 21 of Mottola's book and follow the instructions.



Those fortunate enough to have a Language Card and UCSD Pascal already have a great assembler program embedded in the software and can disregard step 2. Knowledgeable programmers with this hardware/software configuration will find Mottola's book a piece of cake—and just as delicious.

The greatest problem facing authors writing about assembly languages is the burden of jargon that must be dealt with. *Software and programming* are thick with jargon, but assembler languges take it to extremes. Just learning the vocabulary is a job that many Basic users try to avoid and a hurdle that keeps some people from getting into computers at all.

Hence, one proof of an author's skill lies in his ability to cut through the jargon and expose the concepts using only a minimum of new vocabulary. Apple users will find that this book passes the test. It's as natural and straightforward as they come. Reading a chapter a night (and doing the examples) for two weeks should develop the ability to deal with assembler on the Apple. That's only six or seven pages an evening.

Mottola makes much use of existing assembler subroutines in the Apple II hardware (F8 ROM), such as HOME, VLINE and SCROLL. Since the sweat of genius went into creating these subroutines and the Apple owner has paid the price of possession, even the casual owner must realize that a good payout on time and effort can be had only if there is a way to take more advantage of the "guts" of the machine. Find out what those subroutines are, what they do, their names and their addresses and call them up via assembler code.

For the Apple Basic user who is interested in learning 6502 assembler by using any of the more detailed and extensive books (there are a lot of good ones out there), Mattola's little primer is a great stepping stone. Other more conventional texts are likely to be two or three times larger and much more demanding (and likely to appeal to the seasoned programmer who wants to add to his repertoire of languages).

Assembly Language Programming for the Apple II does include a few bobbles. At the top of page 4, the arrow labeled "ten's" should read "16's." And the section on subtraction (pp. 54–55) could be a bit more clear on two's complement arithmetic. But those are really only quibbles. Most of the book, especially the sections of chapter 1 that deal with decimal-to-hexadecimal number conversions and vice versa, is real gold.

James F. Derry
Akron, OH

PET Interfacing

James M. Downey and Steven M. Rogers
Howard W. Sams & Co., 1981
4300 W. 62nd St.
Indianapolis, IN 46268
Softcover, 264 pp.,$16.95

PET Interfacing is a much-needed book. It's an understandable guide to three of the most useful interfaces included on Commodore PET and CBM computers—the user port, the memory expansion connector and the IEEE-488 bus.

Along with a wide variety of hardware projects, the book also includes a full description of the CBM Basic software needed to put these interfaces to work.

This volume is intended primarily for the 2001 series PET computers with large keyboards and upgrade 2.0 Basic. New features of the 4.0 ROM set are not included. For the most part, this doesn't matter.

Two major interfacing problems handled in the book, however, are affected. One is the linefeed that normally follows carriage-returns sent to an IEEE or cassette file. The other is the computer's timeout on slow IEEE devices. Both are now easily selectable from Basic.

Similarly, inputting a string variable longer than the input buffer no longer crashes Basic. Instead, the program halts with a "string too long" error. In addition, inputting string information into a numeric variable from a file now results in a "bad data" error instead of a crash.

Along the same lines, two of the newest hardware features are not covered—the ability to disable the entire standard ROM set by grounding a single line on the memory expansion connector of current models, and the built-in capability of the 6545 video interface chip to handle a faster-scan light pen on these models.

What the book does cover, it covers

extremely well. It includes the first sensible explanation I've seen of the 6522 VIA chip; that alone makes the book worth its cost. It also includes excellent discussions of the user port, address decoding, many of the common 7400 series TTL integrated circuits and IEEE handshaking.

Authors James Downey and Steven Rogers carefully avoid using machine language until the very end. But they include source code, vastly easing the user's task in changing the program for future needs. Assembly-language programmers will find the book's Basic listings easy to convert to machine language.

Sticking entirely to Basic turned out to be cumbersome only once. In the brief discussion of binary-coded decimals, the authors should have mentioned that the PET's 6502 microprocessor has a special decimal code for this task.

PET Interfacing also provides several construction projects, but I have noticed over the years that hobby kits are rarely cheaper than assembled products. For example, the parts for a home-built IEEE printer interface cost $120—the same price I paid for a fully-assembled IEEE interface. The assembled interface has served me well for a couple of years and it occupies a tenth of the space needed by the home-made interface.

This doesn't mean you should not build the projects. It does, however, mean you do not need to reinvent the wheel. Printer, modem, plotter interfaces, home control interfaces and joystick interfaces are already commercially available for CBM computers. Therefore, if you build your own, do it to get special features, to use up surplus chips or to practice wire wrapping—not to save money.

I came away from *PET Interfacing* planning a project that's not included in the book—a super-simple bidirectional IEEE-to-serial interface. On the other hand, a Commodore VIC computer would do the same thing, and costs less than $300.

In summary, *PET Interfacing* is an excellent book from which you will learn a great deal. However, to use it well, bring to it some knowledge of wire wrapping and 7400 series integrated circuits, and an awareness of what products are commercially available.

James Strasma
Pawnee, IL

Computer Choices: Beware of Conspicuous Computing

H. Dominic Covvey and
Neil Harding McAlister
Addison-Wesley, 1982
Reading, MA 01867
Softcover, 221 pp. $8.95

Reading *Computer Choices* may make you want to chase after its authors with a baseball bat. Or it could leave you in a fit of uncontrollable laughter.

Subtitled *Beware of Conspicuous Computing*, this book covers the shortcomings of computers. Authors H. Dominic Covvey and Neil Harding McAlister blow the lid off "hi-tech exhibitionism" and offer the reader their views on how to choose and use systems that satisfy "real" needs.

Reading the first few chapters of *Computer Choices* left me mad. Starting with the premise that computers steal time, jobs, privacy and freedom, the authors launch a nonstop diatribe about the horrors of living in an automated age. My values were assaulted, my livelihood debauched.

Fortunately (for my blood pressure's sake), I continued reading. After reaching the third chapter, "Tales of Horror," my indignation turned to mirth with the discovery that the worlds of Messrs. Covvey and McAlister are far different than mine. They describe a life haunted by cash-gobbling mainframe monsters; I live in peace with an inexpensive microcomputer.

Yes, microcomputers fail, but not in the ways that *Computer Choices* describes. Although it is labeled a "micro book," the coverage of the personal computing phenomena is both outdated and biased. I almost feel sorry for the authors. They live lives of mainframe torment, seemingly unaware of the power and effectiveness of "toy" microcomputers.

The "toy" status assigned to micros should have tipped me off that something was fundamentally wrong with *Computer Choices*. Instead, I finished all 221 pages before it became clear: This is not a book about computers; it is a book about human nature.

Is computer advertising, as the authors contend, seductive and misleading? Perhaps. But any intelligent consumer takes advertising with a grain of salt. After all, do we really think that our sex life is dependent on wearing Old Spice cologne? Of course not, nor is a computer going to make up for poor planning or ignorance.

Do programmers promise more than they can deliver? Yes, and so do lovers and athletes. The saying "guns don't kill people, people kill people" comes to mind. Who should we blame for our computer failures? Are the tiny bits of silicon at fault or is it something much more abstract?

You'll find far better books for learning how to choose and use a computer. What *Computer Choices* does do is remind us that computers are just another one of man's good-bad creations. But labels like "conspicuous computing" or "hi-tech exhibitionism" only serve to disguise the true issue.

Tim Daniel
Oxford, OH

CLUB NOTES

Adam's Apple

Adam's Apple III is a new club in Redwood City, California, intended for Apple III computer users. Initial annual membership is $1, and a free graphics program is offered.

If interested, send a self-addressed, stamped #10 envelope to David Adams, Adam's Apple III, PO Box 3151, Redwood City, CA 94064.

San Diego Computer Society

The San Diego Computer Society is a general interest club which meets at noon the third Saturday of each month (except August and December) at the San Diego County Education Center, Linda Vista Road, San Diego, CA. For information, contact the Society at PO Box 81537, San Diego, CA 92138.

Denver Computer Society

The Denver Amateur Computer Society (DACS) holds a general meeting on the third Wednesday of each month, 7 p.m. at the Educational Plaza, 7350 North Broadway.

Membership, including the monthly newsletter, Interrupt, is $12 annually. Write DACS at PO Box 1235, Englewood, CO 80150.

Micro in New Zealand

For you "down-under" readers, the New Zealand Microcomputer Club meets the first Wednesday each month, and there are various system users groups. The meetings are held in the V.H.F. Group 66 Clubrooms, Hazel Ave., Mt. Roskill (off Dominion Road), Auckland.

For more information, write the N.Z. Microcomputer Club, Inc., PO Box 6210, Auckland, New Zealand.

DEALER DIRECTORY

El Monte, CA

Altos, Eagle and M/ACOM-OSI business computer specialists. Serving greater Los Angeles area with all your business computer needs. In-house service, custom programming, terminals, printers, etc. Open 9 AM–6 PM. **Computer Challenge Corp., 9040 Telstar Ave., suite 107, El Monte, CA 91731. 572-7292.**

Aurora, IL

Full line of Apple Computer and Fortune Computer. Hewlett-Packard Personal Computers, Calculators and Supplies. IDS Prism, SMC and Daisywriter Printers. **Farnsworth Computer Center, 1891 North Farnsworth Ave., Aurora, IL 60505 (851-3888) and 383 East North Ave., Villa Park, IL 60181 (833-7100).**

Houston, TX

Medical microcomputing software for the Apple and IBM Personal Computers. Thoroughly tested in major medical centers. Programs for cardiac catheterization, echocardiography, OB ultrasound, intensive care. **Trinity Computing Systems, 1020 Holcombe, Suite 408, Houston, Texas 77030. 790-1894.**

Nokomis, FL

We are the leading area computer store. We carry Cromemco, Apple, Vector Graphic; printers and terminals. We offer full software support including G/L, A/R, payroll and word processing. **Computer Centre, 909 S. Tamiami Trail, PO Box 130, Nokomis, FL 33555. 484-1028.**

Akron, OH

Atari video game authorized independent servicenter. Games serviced by factory trained technicians. Fast turnaround. Dealer inquiries invited. We stock genuine Atari game and joystick parts. **Greensburg Electronics, 2618 Massillon Road, Akron, OH 44312. 644-3178.**

Vienna, VA

CONTRACT PROGRAMMER. Monthly newsletter for contract programmers. Contains advice on managing your free-lance programming business, plus hundreds of solid leads to programming contracts. Free sample. **Contract Programmer, Box 813-D, Vienna, VA 22180.**

Dealers: Listings are **$15** per month in prepaid quarterly payments, or one yearly payment of **$150**, also prepaid. Ads include 25 words describing your products and services plus your company name, address and phone. (No area codes or merchandise prices, please.) Call Michelle at 603-924-9471 or write *Microcomputing*, Ad Department, Peterborough, NH 03458.

Los Angeles ETUG

A local chapter of the ET-3400 Users Group (ETUG) has been formed in Los Angeles.

For information on meetings and membership of LAETUG, contact Gilbert Murillo at Heathkit Electronic Center, 2309 South Flower, Los Angeles, CA 90007, or call 213-749-0261.

Engineering Software Exchange

The Engineering Software Exchange seeks to stimulate the flow of engineering software. With present membership concentrated in the chemical engineering field, the Exchange wants to broaden membership to other engineering fields.

The Exchange newsletter is $6 annually for six issues. Those interested write the editor, Lidia LoPinto, 41 Travers Ave., Yonkers, NY 10705.

Sneak Previews

Even though you've just barely had a chance to digest the contents of this issue, let's take a look ahead at some upcoming issues for those of you who want to plan ahead. Next month's issue of *Microcomputing* will feature reviews of the latest products from Epson—the QX-10 and HX-20 microcomputers. *Microcomputing* puts these two systems through their paces to give you an objective and comprehensive view of these two machines.

In May, *MC* will take a look at the wonderful world of Winchesters and hard disks. We will include a feature article about this new hard disk technology and explain how to go about selecting and interfacing a Winchester disk. Also, *Microcomputing* technical editor G. Michael Vose will take us on a behind-the-scenes look at manufacturing hard disks. We'll also publish a comprehensive list of Winchester and hard disk products along with their characteristics.

NEW SOFTWARE

Edited by Dan Muse

Making Games

Coco 2 is an educational program which enables you to design and play your own computer games. The program runs on the VIC-20 with 16K and the Commodore-64. It is also available for the Atari 400 and Atari 800 computers.

Coco 2 requires no prior computer knowledge. Using a menu-format, you design the game objects, colors, sounds, scoring, speed and instructions.

The program is designed to let anyone of any age learn about computer programming. Coco 2 comes with a cassette tape, disk, 64-page manual and joystick port adapter. The package costs $39.99 for the VIC-20 and Atari 400. The Atari 800 and Commodore-64 versions cost $49.99.

ISA Software Inc., 14114 Dallas Parkway, Suite 530, Dallas, TX 75240. Reader Service number 470.

PC Educational Game

Insoft (10175 SW Barbur Blvd., Suite 202B, Portland, OR 97219) has released a series of educational games for the IBM Personal Computer.

Wordtrix, the first game in the series, is a word game which pits you against the computer. Both you and the PC attempt to find words in a random grid of letters, but the computer with its built-in dictionary and multiple levels of play is a formidable opponent.

The game is designed for all ages and costs $34.95. Reader Service number 466.

E-Z Tax

E-Z Tax is a personal income tax preparation program. The software is menu-driven and compatible with Apple, Atari, IBM or CP/M-based systems.

E-Z Tax is capable of preparing the 1040A (short form), the 1040EZ (the new IRS form for single tax payers) and over 25 other IRS forms and schedules (long form).

The program includes a minimal-error check-point feature. After every section of the income tax form is completed, the program redisplays all information for proofreading and correction. E-Z Tax requires 48K RAM and one disk drive. A printer is recommended. The program costs $69.95 and is available from E-Z Tax, 2444 Moorpark Ave., Suite 208, San Jose, CA 95128. Reader Service number 460.

Connecting IBM to TRS-80

Personal Computer Products (1400 Coleman Ave., Suite C-18, Santa Clara, CA 95050) has released a product that allows the transfer of files from TRS-80 Model I and Model III systems to the IBM Personal Computer.

Communications programs for both systems are included. Also included is an adapter that allows the two systems to connect and a test communication file that verifies correct connection and proper transmission.

The package is designed for transferring programs, text files and spreadsheet data. The program is structured to allow any file to be transferred.

The complete package costs $39.95. Reader Service number 467.

Go Forth on the PC

PCForth, from Armadillo Int'l Software (PO Box 7661, Austin, TX 78712) is a fig-Forth version of Forth. It is designed for the IBM Personal Computer and requires at least 16K of RAM and one disk drive.

In addition to the standard fig-Forth words, PCForth has several additional words which customize it for the PC. Included are special dump and printer functions. PCForth also includes the standard fig-editor.

PCForth programs are transportable. Since they are fig-Forth, which is the most widely used version of Forth, you can transfer applications to most other computers.

PCForth, complete with disk and manual, sells for $59.95. Reader Service number 471.

C-64 Software

Four new software products for the Commodore-64 are being introduced by Human Engineered Software (HES), 71 Park Lane, Brisbane, CA 94005.

HES's 6502 Professional Development System is a cassette-based assembler package that offers a one- or two-pass 6502 assembler using standard MOS mnemonics and operand formats. It is also available for the VIC-20. It sells for $29.95.

HESMON 64 is an adaptation of HES's HESMON cartridge for the VIC-20. It gives 64 owners a machine-language monitor with a mini-assembler. It costs $39.95.

Turtle Graphics II is a version of David Malmberg's Turtle Graphics. This version utilizes the full graphics features of the Commodore-64. It sells for $59.95.

HESWriter 64 is a word processing package which features full-screen editing. It is based on Human Engineered Software's HESWriter for the VIC-20. It sells for $44.95. Reader Service number 462.

Micro Mother Goose

Micro Mother Goose is the first in a series of Classic Family Software from Software Productions, Inc. (2357 Southway Drive, PO Box 21341, Columbus, OH 43221). The software is designed for the Apple II computer.

Micro Mother Goose includes three games for children three to nine years old, and nine animated computer comics with traditional music.

The games begin slowly for young or learning-disabled children, then challenge all at higher levels. Operation is easy and no reading is necessary. All that is required to play the games are the spacebar, return key and a game paddle or joystick.

Micro Mother Goose is not copy protected, so parents and teachers can make back-up copies. In addition to the software, six color Mother Goose stickers, an 11×27-inch color "Micro Do's and Don'ts" poster, an extra disk label for a back-up disk, a 16-page parents and teachers manual, and a fan club and registration card are included in the package.

Micro Mother Goose costs $39.95. It runs on the Apple II computer with Applesoft, and requires one disk drive, 16-sector DOS 3.3 and a game paddle or joystick. Reader Service number 472.

Getting Statistical

Stats Plus is a general statistics package with a powerful database management system available from Human Systems Dynamics (9249 Reseda Blvd., Suite 107, Northridge, CA 91324).

A special feature of Stats Plus is that it is VisiCalc-compatible. With Stats Plus, electronic worksheet-files can be used in preparing data files or in producing high-resolution graphics such as scatterplots, bargraphs or polygon charts.

Conversational menus on the computer screen guide you through the program. You can design files, then count, search, sort, review and edit with a set of easily-used instructions. This data can also be ranked, indexed, and even reorganized.

Stats Plus can handle both random-access and sequential files and produce data that can be instantly accessed using the self-prompting screen

instructions.

The statistical analysis portion of Stats Plus includes descriptive statistics, frequency distribution, correlation matrix, and many other analyses.

Stats Plus is priced at $200 and is designed for the Apple II with 48K, ROM Applesoft, one or two disk drives and optional dot matrix printer. Reader Service number 473.

TaxMan-83

TaxMan-83 is an interactive tax management program for VisiCalc and SuperCalc electronic spreadsheets. TaxMan-83 prepares and prints 1982 individual income tax returns.

TaxMan-83 is designed to reduce lengthy tax computation. Multiple overlays consider all tax alternatives and compute the lowest tax possible based on your filing status. Sales-tax tables for all states are included and deductions for sales tax are automatically computed. All forms and schedules are included, calculated and printed.

Itemized deductions exceeding certain statistical limits are flagged, so you may reconsider and adjust or submit additional documentation with your return.

TaxMan-83 will prepare many of the federal tax forms and is available for most microcomputers with VisiCalc or SuperCalc. Currently, it will support the Apple II, Apple III, Atari 800, IBM Personal Computer, Osborne I, NorthStar Advantage/Horizon, TRS 80 Models II and III, Commodore PET and other eight-inch CP/M systems.

Atsuko Computing International, 303 Williams Ave., Huntsville, AL 35801. Reader Service number 469.

Apple Software

John Wiley & Sons, Inc. (605 Third Ave., New York, NY 10158), has introduced two book/disk combinations for the Apple II.

Apple Basic: Data File Programming, by LeRoy Finkel and Jerald R. Brown (September 1982, $32.90), shows how to get maximum use from Apple for data management.

The package features an advanced Basic book that describes how to develop and maintain files on the Apple. The program instructs you how to program and maintain data files for billings, catalogs and lists, numerical and statistical data, and more. The book is accompanied by a 5¼-inch disk. It requires one 16-sector disk drive and 32K of memory.

Golden Delicious Games for the Apple Computer, by Howard M. Franklin, Joanne Koltnow and LeRoy Finkel (September 1982, $47.90), features lessons on how to create games for the Apple. The package provides ready-to-use game programs for the novice and also game subroutines that can be added to, combined and embellished by more sophisticated programmers.

The package includes two 5¼-inch disks for the Apple II (16-sector disk drive and 32K required). Reader Service number 468.

Protecting Program

DES-Crypt is a data encryption package which is a software implementation of the National Bureau of Standards data encryption stand (DES) algorithm.

DES-Crypt protects the privacy and integrity of the information contained in any file; some possible applications of DES-Crypt include protecting confidential financial information, patient records, student grades, software, databases, electronic mail, sensitive text, etc.

DES-Crypt is an alternative to dedicated encryption hardware. It works with any file and includes functions for encrypting, decrypting, verifying encryption, data authentication (via cryptographic checksums), destroying plaintext, creating random hexadecimal keys and listing files.

Encrypting and decrypting at 40K to 60K bytes per minute, a typical file is secured in less than a minute and a group of files can be operated on at one time.

DES-Crypt is available for 8080/8085/Z-80 systems run-

ning CP/M-80, and for the IBM Personal Computer and other 8086/8088 systems running MS DOS (PC-DOS) or CP/M 86. It sells for $149.

Trigram Systems, 3 Bayard Road #66, Pittsburgh, PA 15213. Reader Service number 467.

Home Tax Preparation

Learning Shack, Inc. (17981-J Sky Park Circle, Irvine, CA 92714), has released a self-teaching personal income tax preparation system called HomeTax.

You do not have to be experienced in tax preparation to use HomeTax, because of a concept called AutoLearn.

The HomeTax system prompts you on all necessary tax questions and processes the information required for completing tax returns. If you own a printer, a special 1040 transparency (included with the package) can be used over printout reports to create finished tax returns on a copy-ready machine.

Learning Shack provides a toll-free number where qualified tax specialists can be contacted to answer technical questions. Learning Shack will also issue periodic releases concerning changes in the tax laws, and will offer annual renewal disks to update the system to reflect tax law changes.

HomeTax runs on most CP/M computers with dual disk drives and at least 48K RAM (Apple II requires Softcard). The package sells for $95. Reader Service number 474.

Brighten Up Your Business Graphics

BPS Business Graphics enables IBM Personal Computer users to create a variety of multicolor charts and graphs using simple, English-language commands. Data for the graphs can be entered from the keyboard, or extracted from VisiCalc and SuperCalc models, accounting reports and word processing documents. Hard-copy output may be obtained from any of 40 printers and plotters.

BPS Business Graphics can create graphics formats that include lines, horizontal and vertical bars, multiple bars (up to four sets), pies, partial pies, areas, points and any combination of these on the same axes. Also, commands that generate frequently used graphs can be stored on disk, enabling PC users to create or update standard graphics reports automatically. BPS Business Graphics can also perform several statistical functions.

Hardware requirements for using BPS Business Graphics are an IBM Personal Computer with 128K of main memory, two disk drives, a color graphics adapter and a standard video monitor. The package is manufactured by Business & Professional Software, Inc. (143 Binney St., Cambridge, MA 02142); it costs $350. Reader Service number 475.

Communications Software

Hayes Microcomputer Products, Inc. (5923 Peachtree Industrial Blvd., Norcross, GA 30092), is introducing the Smartcom II—a communications software package for the IBM Personal Computer with a Hayes Smartmodem 300 or high-speed Smartmodem 1200. Smartcom II manages data transfer over the telephone lines and brings the microcomputer, disk drives and printer into the activity.

Smartcom II is built around a simple but comprehensive menu of program options, supported by help information which is displayed on command. The Help feature provides a quick response to questions about parameters, prompts and messages.

Smartcom II is supported by the auto-dial/auto-answer Smart-modems and automatically originates and answers telephone calls. It automatically logs a user onto a remote system, such as a timesharing device, an information utility, a database or a microcomputer.

The program supports up to 16 disk drives (including hard disk), both parallel and serial printers and either a monochrome or color/graphics display. Smartcom II requires an 80-column monitor, one disk

drive, 96K RAM, an asynchronous communications card and DOS 1.10 or 1.00. It sells for $119. Reader Service number 464.

Timex-Sinclair Programs

Human Engineered Software (71 Park Lane, Brisbane, CA 94005) is introducing several software products for the Timex-Sinclair 1000.

Budget Master 1000 is a full-featured household budget program for the TS-1000. The system displays totals in monthly, year-to-date and average formats. The package costs $15.95.

Human Engineered Software's 2K Programmer Kit provides novice programmers with the same time-saving utilities previously available only with expanded memory ($12.95).

Reversi 1000 is a version of the 19th century parlor game. Players pit their skill against the computer or other players ($15.95).

2K Trek is a strategy game which places you in distant galaxies. You command a starship against the Kutar Empire in an effort to save the United Star System ($12.95). 3D Maze ($15.95) is a game in which you seek treasure and escape within an elaborate, randomly generated, three-dimensional maze.

Astro 1000 is an adaption of the popular arcade game. The game is written in machine-language. Nine levels of play and three sizes of asteroids challenge the player. The game sells for $14.95. Cosmic Invaders is a quick, machine-language action game which features nine skill levels, six rows of invaders and an ever-increasing rate of play. The price is $14.95.

Human Engineered Software features a full line of games, language and utility software for the TS-1000. Reader Service number 461.

Scholastic Software

Scholastic, Inc. (730 Broadway, New York, NY 10003), has released Wizware, a new line of computer programs designed for children ages eight to 14. Wizware deals with an array of topics ranging from art and literature to simple computer programming.

Six programs, slated for the Spring of 1983, will be available in disk and cassette formats. The programs will be compatible with the Apple II Plus, Atari 400/800, TI 99A and VIC-20 computers.

The Microzine will allow children to participate in activities, rather than just read about them. For example, children will be able to simulate riding in a hot-air balloon by programming its flight. They can also program the outcome of an adventure story or interview a popular personality using their own questions.

Square Pairs lets young users develop basic learning skills. By matching numbers, words and patterns, the child becomes familiar with logical concepts and strengthens his skills in these areas.

Turtle Tracks, formerly known as Kidstuff, makes the subject of computer programming a colorful adventure. Children learn the fundamentals of computers as they control the movements of a "turtle," commanding it to select colors, draw lines, circles and other shapes.

Nerd Alert is a game in which a group of Nerds is attempting to take over Nerd High. The Nerds have a football filled with Nerd gas. Jocko, the hero controlled by the child, must attempt to block the football to foil the Nerd's plan.

Your Computer is an introduction to computer technology for the first-time user. The program familiarizes the user with how to operate a specific unit. Topics covered include input/output devices, memory capacity and basic programming.

Electronic Birthday becomes a birthday party's master of ceremonies, leading children through activities like electronic pin-the-tail-on-the-donkey. Children also learn interesting facts related to their date of birth, including famous people born on the same day.

The programs cost $40 each for the disk versions and $30 for the cassette versions. Reader Service number 465.

NEW PRODUCTS

Improving VIC

Human Engineered Software(71 Park Lane, Brisbane, CA 94005) has introduced two new products for the Commodore VIC-20 computer.

HESCard is an expansion board which includes four switchable slots and a reset button. The board has high-quality connectors and gold-plated edge fingers. It sells for $29.95.

Soundbox is a device that improves the VIC-20's sound output for arcade games. In addition to the VIC-20, it can be used with Atari, Texas Instruments and other Commodore systems. Soundbox's features include audio out, video out and audio in (for the Commodore 64). It costs $14.95. Reader Service number 462.

IBM-Compatible Computer

Computer Devices, Inc. (25 North Ave., Burlington, MA 01803), has released a portable personal computer which is fully compatible with the IBM Personal Computer. The computer, DOT, takes advantage of 16-bit software and also provides access to existing eight-bit software.

Incorporating Intel's 8088 microprocessor for 16-bit instruction and addressing, DOT provides Microsoft's MS/DOS as part of its package. An optional eight-bit Zilog Z80 CPU can implement CP/M 2.2.

On its 8088 board, DOT offers a minimum of 32K of user memory (expandable to 256K) and a 24K EPROM. An optional memory board can add another 448K for a total of 704K of addressable RAM.

DOT can be equipped with up to two Sony 3½-inch disk drives. DOT's display is 5 x 9 and separate logic and control circuitry is provided for the bit-map-graphics feature which is implemented through a separate 32K of video RAM, mapped one-for-one to the CRT. Selectable high-resolution pixel matrices include 640 x 200 (IBM Mode) and 1024 x 248 (DOT mode).

DOT, from Computer Devices, Inc., is a portable computer with full IBM Personal Computer compatibility.

A choice of character display modes is available, including a full 132-, 80- or 40-characters wide display in 25 or 16 lines. DOT provides a full IBM PC 256 character set, including a wide range of international characters.

DOT provides two asynchronous RS232C communications ports for high-speed connection to a local host, a terminal or a variety of peripherals, such as plotters or letter-quality printers. Two IBM bus-compatible card slots, which can accommodate cards up to 10½ inches long, are also provided.

Depending upon configuration, DOT costs from $2995 to $3995. Reader Service number 491.

SoundTrap, from Trace Systems, silences noisy printers.

Quiet Your Printer

SoundTrap is an acoustical housing unit which confronts the problem of noisy printers. SoundTrap reduces printer noise to a level where a phone conversation can be conducted while standing next to a functioning printer.

SoundTrap also efficiently utilizes desktop space. In an upright position, held by the optional stand, SoundTrap becomes a data holder or copy stand, allowing for easy reading. SoundTrap also provides storage for paper and simplifies paper feeding and fan folding.

SoundTrap accommodates most popular printers, including Epson, NEC, Okidata, IBM and Apple. It sells for less than $100 and is available from Trace Systems, Inc., 1928 Old Middlefield Way, Mountain View, CA 94043. Reader Service number 489.

New Disk Systems

Tandon Corporation (20320 Prairie St., Chatsworth, CA 91311) has announced a family of 3½-inch microfloppy disk drives and a family of half-height 5¼-inch floppy disk drives.

The TM35 (3½-inch microfloppy disk drive) comes in two models to achieve compatibility with two classes of disk drives. The model TM35-2 is compatible with the 5¼-inch industry standard interface. It will produce a 5¼-inch look-alike disk with 40 tracks per side, double-sided recording, 250K-bits/sec transfer rate and 500K byte capacity. It can fit into a 5¼-inch half-height envelope.

The TM35-4 is compatible with the Sony OA-D30V microfloppy disk drive's interface, software and disk. It has data recorded on both sides, providing 875K of storage capacity. The TM35-4 accesses data in an average of 85 msec and moves from track to track in three msec. It features a recording density of 7610 bits per inch, 135 tracks per inch and 70 tracks per side.

The TM35's physical package is 1 5/8-inches high, four inches wide and 6½-inches deep. The media is a 3½-inch Sony-type, oxide-coated disk with a rigid case and hard metal hub. An automatic shutter door is provided for disk access and security.

The TM55 series is an expansion of Tandon's 5¼-inch half-height floppy drives. Two models are offered. The TM55-2 is a double-sided, 48 tracks-per-inch drive with ½ megabyte capacity. The TM55-4 is a double-sided, 96-TPI drive with one megabyte capacity.

Both TM55 models can read and write in a single-density format or, using recording techniques, in double density format. The transfer rate is 250K per second.

The TM55 measures 1 5/8-inches high, 5¾-inches wide and eight inches long. It weighs three pounds. For additional information, including price, contact Tandon Corporation. Reader Service number 483.

The Portable M6000P

M6000P is a portable microcomputer system from Micro

2MHZ 6809 SYSTEMS

GIMIX offers you a variety to choose from!

38 MB WINCHESTER SYSTEM $17,498.99

HARDWARE FEATURES:

- ★ 2MHz 6809 CPU
- ★ 512KB Static RAM
- ★ 8 RS232C Serial Ports
- ★ 2 Parallel Ports
- ★ DMA Double Density Floppy Disk Controller
- ★ Dual 8" DSDD Floppy Disk System
- ★ Dual Winchester Subsystem with Two19 MB 5¼" Winchester Drives

SOFTWARE FEATURES:

- ★ OS-9 LEVEL TWO Multi-User Operating System
- ★ OS-9 Debugger
- ★ OS-9 Text Editor
- ★ OS-9 Assembler

19 MB WINCHESTER SYSTEM $8998.09

HARDWARE FEATURES:

- ★ 128K Static Ram
- ★ 2MHz 6809 CPU
- ★ 19 MB 5¼" Winchester DMA Subsystem
- ★ 4 RS232C Serial Ports
- ★ 1 MB 5¼" Floppy Disk Drive
- ★ DMA Double Density Floppy Disk Controller

SOFTWARE FEATURES:

- ★ OS-9 LEVEL TWO Multi-User Operating System
- ★ OS-9 Text Editor
- ★ OS-9 Debugger
- ★ OS-9 Assembler

128KB MULTI-USER SYSTEM $6997.39

HARDWARE FEATURES:

- ★ 2MHz 6809 CPU
- ★ DMA Double Density Floppy Disk Controller
- ★ 128KB Static Ram
- ★ 2 RS232C Serial Ports
- ★ Dual 8" DSDD Floppy Disk System

SOFTWARE FEATURES: Your choice of either UniFLEX or OS-9 LEVEL TWO. Both are Unix-like Multi-User/Multi-Tasking Operating Systems.

56KB FLEX/OS-9 "SWITCHING" SYSTEM $4148.49

HARDWARE FEATURES:

- ★ 2MHz 6809 CPU
- ★ 56K Static Ram
- ★ 2 RS232C Serial Ports
- ★ DMA Double Density Floppy Disk Controller
- ★ 2 Built-in 5¼" 40tr DSDD Disk Drives (80 Track DSDD Drive Option . . add $400.00)

SOFTWARE FEATURES:

- ★ GMXBUG monitor — FLEX Disk Operating System
- ★ OS-9 LEVEL ONE Multi-tasking operating system for up to 56K of memory

WINCHESTER SUBSYSTEMS

Winchester packages are available for upgrading current **GIMIX** 6809 systems equipped with DMA controllers, at least one floppy disk drive, and running FLEX, OS-9 LEVEL ONE or OS-9 LEVEL TWO. The packages include one or two 19MB (unformatted) Winchester drives, DMA Hard Disk Interface; and the appropriate software drivers. The Interface can handle two 5¼" Winchester Drives, providing Automatic Data Error Detection and Correction: up to 22 bit burst error detection and 11 bit burst error correction.

Dual drives can be used together to provide over 30 MBytes of on line storage -- or use one for back-up of the other. (More convenient and reliable than tape backup systems.

#90 includes one 19MB Drive, Interface, and Software **$4288.90**
#91 includes two 19MB Drives, Interface, and Software **$6688.91**

Contact GIMIX for systems customized to your needs or for more information.

50 HZ Export Versions Available

GIMIX Inc. reserves the right to change pricing and product specifications at any time without further notice.

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FLEX and UniFLEX are trademarks of Technical Systems Consultants Inc.
OS-9 is a trademark of Microware Inc.

1337 WEST 37th PLACE
CHICAGO, ILLINOIS 60609
(312) 927-5510
TWX 910-221-4055

GIMIX inc.

Circle 22 on Reader Service card.

The M6000P is a new portable computer from Micro Source, Inc.

Source, Inc. (PO Box 319, 595 N. Clayton Road, New Lebanon, OH 45345).

The computer features a Z80 CPU, a ten-slot STD card cage, 64K RAM, dual 5¼-inch double-sided, double-density disk drives, rear external connection for an eight-inch floppy disk, a nine-inch CRT with 80-character by 24-line video interface, and the CP/M 2.2 operating system.

The M6000P is 17 x 20 x 7 inches and weighs less than 35 pounds. The computer sells for $3900. Micro Source, Inc., will configure the system to order if desired. Reader Service number 490.

Improve Your Apple's Sound

CS-19 consists of twin external speakers which plug into the Apple II computer in place of the Apple's internal speaker. By using the Superex CS-19, you can generate greater clarity and better frequency response than with the existing speaker.

The CS-19 brings arcade sounds to the Apple II and is available with an optional headphone jack. The CS-19 is available from Superex International Marketing, 151 Ludlow St., Yonkers, NY 10705. It sells for $19.95 ($21.50 with headphone jack). Reader Service number 488.

PC Modem Plus

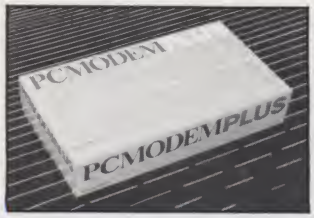
The PC Modem Plus is a communications package designed specifically for the IBM Personal Computer. The package contains everything needed to communicate with independent information services such as The Source and Dow Jones News Retrieval services. The package also allows you to send electronic mail via the IBM PC.

The entire system comes in one box and includes a microprocessor-based, auto-answer/auto-dial 300-baud modem complete with a buffer, an extra serial port and high-speed expandability; full-service, menu-driven communications software; complete instructions and a standard modular phone cable. The modem is expandable to 1200-baud full duplex (212-A compatible) communications with the addition of a piggyback card.

The modem plugs into the chassis of the PC and does not require a special cable. The PC's function keys can be easily programmed to automatically dial frequently used numbers and passwords to connect with independent information services.

The PC Modem Plus is priced at $389 and has a 2K memory in the modem which buffers incoming data to prevent character loss. The modem operates at both full and half duplex and is hardware and software compatible with the IBM PC.

CS-19, from Superex International Marketing, improves the sound capability of the Apple II.



The PC Modem Plus, from Ven-Tel, Inc., is a communications package designed specifically for the IBM Personal Computer.

The AT-88 is a single-density disk-drive system for the Atari 400 and 800 computers.

The PC Modem Plus is manufactured by Ven-Tel, Inc., 2342 Walsh Ave., Santa Clara, CA 95051. Reader Service number 492.

New Atari Disk Drive

Percom Data Corporation (11220 Pagemill Road, Dallas, TX 75243) has released a new disk-drive system for Atari computers. The AT-88 is compatible with both the Atari 400 and 800 and is a single-density drive, utilizing the technology of Percom's double-density disk system.

The AT-88 offers 88K bytes (formatted) with plug-in compatibility to the Atari computers. The AT-88 has its own integral power supply and is shipped with the OSA/Plus operating system at no additional cost. The disk drive may use the Atari operating system software without modification.

The AT-88 is priced at $488. Percom has also lowered the price of its line of double-density disk drives for the Atari from $799 to $699. Reader Service number 493.

IBM PC Printer Interface

Renaissance Technology Corporation (1070 Shary Circle, Concord, CA 94518) has announced a new series of printer buffers. BUFF-ET is a high-speed printer buffer which can store up to 65,000 characters or about 30 average printed pages. The copy feature allows for multiple copies of a document without having to re-send it from the computer.

BUFF-ET has the ability to test itself and print out the results. Power for BUFF-ET can be taken from the printer's power supply or from a common AC adapter. Buffer size is available in 16K, 32K and 64K. A 16K or 32K buffer can be easily expanded.

BUFF-ET comes in both parallel and serial versions. A special PC version contains all the cabling necessary to go directly between the IBM Personal Computer and a parallel printer. Unique to the PC BUFF-ET is its ability to allow other printers to emulate the IBM printer.

The following printers are now compatible with the IBM PC: MX-80 with Graftrax Plus, NEC 8023A, C. Itoh 8510, Prowriter and Prowriter 2.

BUFF-ET, from Renaissance Technology Corporation, is a high-speed, in-line printer buffer. It is available in parallel, serial and PC versions.

The Z-Dubber is an interface which eases the loading of TS-1000 cassette programs.

The prices for the parallel and serial versions are $219, 16K; $249, 32K; $299, 64K. The IBM version sells for $249, 16K; $279, 32K; and $329, 64K. Reader Service number 487.

TS-1000 Cassette Interface

Z-Dubber interfaces a cassette recorder to the TS-1000 (formerly ZX-81). The interface allows difficult cassette programs to be easily loaded.

The Z-Dubber also allows you to connect two cassette recorders to create perfect backup copies of your programs. The Z-Dubber operates on two AAA cells and is packaged in a black case. It costs $29.95, is available from Bytesize Computer Products, PO Box 21123, Seattle, WA 98111. Reader Service number 486.

New Plotters

Yokogawa Corporation of America (2 Dart Road, Shenandoah, GA 30265) and Amdek Corporation (2201 Lively Blvd., Elk Grove Village, IL 60007) have released the Model PL-1000 and the Amplot II, respectively.

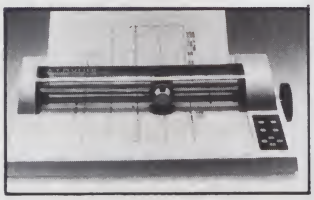
The Model PL-1000 is a four-color plotter designed for the small business and home computer market. The plotter is compatible with most small computer systems. It can handle any size paper up to 11 × 15 and will also produce foil transparencies for overhead projection.

The PL-1000 features a standard RS-232C interface and has many built-in firmware commands, including nine styles, selectable angular rotations in degrees, 15 special symbols and autocircle drawing, and others.

The plotter is 15¾ × 11¾ × 4⅜. It weighs about 13 pounds and sells for $1200. Reader Service number 494.

The Amplot II is a six-color plotter which features high-pen speed, automatic pen retrieval and .002-inch resolution for fast, accurate plots. The Amplot II receives ASCII commands, and built-in software permits additional one-alpha-character commands. Eight-bit parallel and RS-232C operation is standard.

The Amplot II's effective plotting range is ten-inch × 14-inch. Six fiber-tip pens are furnished for plotting on ordinary paper or film. A dust cover and chart hold-downs are also provided. Price of the Amplot is $1290. Reader Service number 496.



The PL-1000, from Yokogawa Corporation of America, is a four-color plotter.

Amdek Corporation's six-color, X-Y coordinate plotter.

VIC-20 and C-64 Products

Computer Marketing Services, Inc. (300 W. Marlton Pike, Cherry Hill, NJ 08002), has released five products for the Commodore-64 and VIC-20. The VIC/64-Switch allows up to eight VIC-20s or C-64s to share disks and printers. It sells for $149.95. The VIC-Relay Cartridge ($59.95) is designed to simplify control of electrical equipment. It contains six relays and two optocouplers.

The VIC-GRAF Cartridge is an aid for studying complicated equations by their graphs. It costs $49.95. A programmable cartridge, called the VIC-STAT Cartridge, consisting of assembler codes to simplify work with statistics and graphics, adding 15 commands to the basic language, is also available for $49.95.

The VIC-Forth Cartridge ($59.95) is an operating system and programming language suitable for nearly every business, as well as in process-control environments. Reader Service number 481.

Voyager 4000

Voyager Systems, Inc. (2192 Anchor Court, Newbury Park, CA 91320), has announced the release of the Voyager 4000 computer.

The Voyager 4000 offers two 5¼-inch, double-sided, double-density floppy disk drives; an 8085-based CPU, addressing 64K of RAM (upgradable to 8085/8088, 8/16-bit coprocessor addressing 1000 bytes of RAM); and up to 20 megabytes of hard disk storage.

Bundled software, consisting of word processing, spreadsheet with graphics, database management, mailing list, payroll, TELEX, executive time management and CP/M operating systems, is included with Voyager 4000.

The Voyager 4000 computer costs $4995. Reader Service number 485.

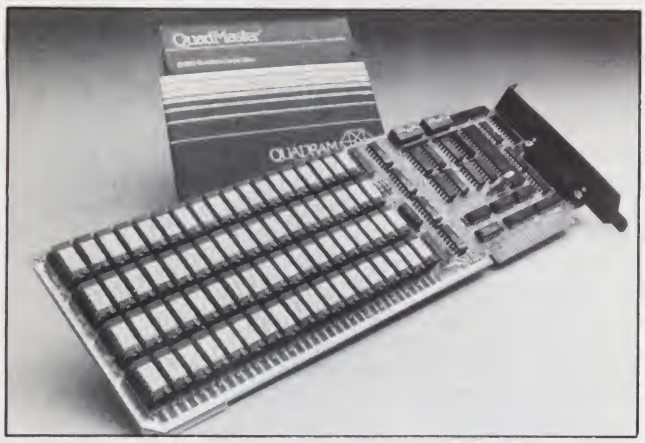
Move Your Apple

The Apple Crate from Percom Data Corporation (11220 Pagemill Road, Dallas, TX 75243) is an enclosure system that makes the Apple II computer easily transportable. The Apple Crate consists of a light-weight structural foam case with a comfortable carrying handle, a detachable keyboard, monochrome monitor, and power supply, making the Apple II portable.

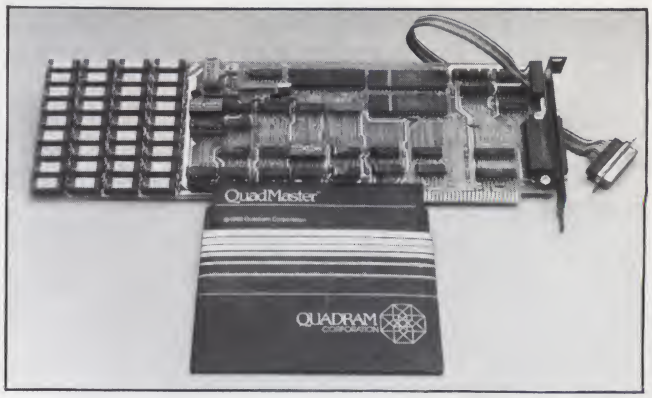
The Apple Crate holds two 5¼-inch floppy disk drives, the functional hardware of the Apple II. The entire system weighs about 25 pounds.

Conversion of an existing Apple II configuration to The Apple Crate can be accomplished with a few screws, which are provided. The price of The Apple Crate will range from $300 to $400, depending on the configuration selected. Reader Service number 482.

The Voyager 4000 computer is a complete and upgradable system which sells for under $5000.



The Quad 512+ offers faster computing and more capabilities for IBM Personal Computer users.



The Quadboard II is an all-in-one board which combines six IBM functions in one.

Apple-Compatible System

The Diamond C-2 is an Apple-compatible, 6502-based personal computer from Diamond Computer Systems (One First St., Los Altos, CA 94022).

The Diamond C-2 is programmed in Microsoft Basic, and contains 64K of on-board memory and 16K of monitor software resident in EPROM. The computer is upgradable to 256K.

The Diamond C-2 offers a full-featured detached step or slope sculpture keyboard with ASCII upper and lowercase; seven Apple compatible I/O slots; 40 column by 24-line character display in a black-and-white or color system; black-and-white graphics display—280 × 192 or 280 × 160 with four text lines; 16-color graphics display—40 × 48 or 40 × 40 with four text lines; six-color graphics display—280 × 193 or 280 × 160 with four text lines; cassette and game I/O cards; and other features.

For additional product information, including price, contact Diamond Computer Systems. Reader Service number 484.

PC Boards

Quadram Corporation (4437 Park Drive, Norcross, Ga 30093) has released two boards for the IBM Personal Computer: the Quadboard II and the Quad 512+.

The Quadboard II is an all-in-one board which combines six IBM PC functions in one. The multifunction board combines two serial ports, chronograph, memory expansion, RAM disk and spooler; they are all compatible with IBM PC hardware.

The two RS-232C asynchronous ports can be used for modems, printers and other serial devices. Memory expansion is socketed and fully expandable in 64K increments up to 256K. Dip switches allow selective addressing on any 64K block.

Quadboard II's chronograph is an accurate real-time clock calendar which eliminates the hassle of manually inputting the date and time when booting the system. QuadMaster software is included at no extra cost and contains a QuadRAM Drive for simulating a floppy drive in Quadboard II memory. Quadboard II comes with a full one-year warranty and sells for $595 (64K), $775 (128K), $895 (192K) and $995 (256K).

The Quad 512+ board offers IBM PC users faster computing and more capabilities. The board combines memory expansion of 512K (in increments of 64K, 256K or 512K), a serial port, RAM disk and spooler. This leaves the IBM PC with four slots open for additional boards.

The Quad 512+ fully supports IBM communications software and has eight 64K memory banks which may be addressed individually by a dip switch. The Quad 512+ also comes with a full one-year warranty and costs $475 (64K), $895 (256K) and $1295 (512K). Reader Service number 480.

Circle 131 on Reader Service card.

REVIEWS

(from page 178)

memory locations.

An intermediate-speed-test option stops only at selected "soft" breakpoints you have set. Since in this option the monitor is still testing for breakpoints before every instruction is executed, it is possible for you to set breakpoints even in ROM routines.

When your program is assembled and loaded, and you want to save it, the VICMON cartridge provides commands allowing you to access the operating-system routines that save the block of memory containing your program.

Other features provide for easy coordination with Basic. There is a command to exit from the monitor to Basic and a provision to save Basic's zero-page contents, with all their vital pointers, and restore them once you return to Basic.

Drawbacks

There are some minor deficiencies in the functioning of the monitor program itself. For example, there is no provision for conversion from decimal to hexadecimal, so you must enter all operands in hex. This is only a small inconvenience, but it is a surprising omission considering that so little programming would have been needed to provide this feature. There is also some awkwardness in the design of the user-program dialog.

These problems with the program itself are minor, but the deficiencies of the documentation are more serious. The manual provided was apparently put together in a hurry and has many typographical and format errors.

It has a useful section on getting started, with a sample dialog showing how to use the most important commands. This has relatively few errors and is, for the most part, clearly written.

The reference section describing each command is in terrible shape and in places it breaks down into gibberish. It is not that these sections are technically obscure; they are not. It's just that here and there you find something that completely defies interpretation as a sentence. There are also features of the VICMON that are simply not described in the manual. However, with a little fooling around, you will soon be familiar enough with the commands to forget about the poor documentation.

In summary, though, any software product can be improved, and although I hope that Commodore is working on a debugged manual, this is a good machine-language support system for most purposes and will be of value to VIC owners who use machine language more than occasionally. *(Commodore, Valley Forge Corporate Center, 950 Rittenhouse Road, Norristown, PA 19403. $69.95)*

John Rhoads
New Haven, CT

Graphics Processing System

A graphics editor
For the
Apple II

If you lack artistic skills, but have the desire to compose your own drawings with a computer, a logical move would be to purchase a graphic processing system. Stoneware, Inc. states in its introduction to the manual that Graphics Processing System is to graphics what Word Star, a sophisticated word processor, is to writing, or what Visicalc is to processing numbers.

Well, I am slightly at a loss for words to gently express what I experienced with GPS. It is the reviewer's responsibility to learn a program and then point out to the reader its advantages and disadvantages.

> I am slightly at a loss for words to gently express what I experienced with GPS.

Word Star, for example, is difficult to learn, but once mastered it is a joy to use. Since Word Star is disk oriented you practically never run out of memory. GPS, however, uses memory voraciously, and it's easy to find yourself boxed in if you do not periodically check for the number of bytes available.

You can draw free-hand or by line. If you want as simple a shape as a circle, good luck. There are no standard shape tables. Erasing part of a drawing is tricky. I have not yet been able to erase to my satisfaction.

The most charitable statement I can make about Stoneware's GPS is that you can accomplish fine drawings provided you have a lot of patience and own an Apple Graphics Tablet. To draw with the game paddles or joysticks is like using a well known children's toy called Etch-A-Sketch; this is not a very satisfactory method.

When you purchase GPS you get two disks and a 37-page instruction manual. The instructions are divided into ten chapters including a tutorial, but you won't find many examples or details. There is a table of contents, but no index is included.

Getting started is simple. You boot the main program disk and pick one of four drawing tools, depending on what you have available. The documentation always refers to the game paddles and that is what I used for this review.

GPS is a menu-driven program. As soon as you are in the drawing option, the computer begins to suffer from a most peculiar kind of amnesia. The keyboard is no longer operational, so it becomes tricky to get from one menu to the next.

There are eight main menus with more than 50 options. To get to the different menus, you have to navigate the cursor around the monitor by rotating the game paddles. When you reach the desired option, you push the little red button. It sounds simple, but it isn't. Those buttons are very sensitive, and if you push too hard, you land somewhere else.

Once you are in the drawing option, your cursor appears as a single pixel which is moved around the drawing field horizontally with the #0 and vertically with the #1 paddle.

If you have an Apple Graphics Tablet the whole operation becomes more positive. You now have one single drawing device which can be moved over the graphics tablet like a pencil.

The options are impressive. Once you have completed your basic drawing it can be manipulated in many ways. It can be rotated, added to other drawings, enlarged with the zoom feature or labeled from a choice of two-character sets. You obtain the latter from the second disk which is included in the GPS package.

To use GPS you need a 48K Apple II Plus, but 64K is recommended, one disk drive, monitor and game paddles. I highly recommend an Apple Graphics Tablet or Symtec Light Pen. Apple Silentype, IDS and Epson printers are directly supported. If you have a different printer, you will have to save your drawing and then use your own driver to obtain a hard copy. The program disk is copy protected. A back-up is available to registered owners for a handling fee of $15.

Before you buy this program I strongly recommend that you try it at your dealer for at least an hour.

(Graphics Processing System by Stoneware, Inc., 50 Belvedere St., San Rafael, CA 94901. Standard version $69 (game paddles or joysticks only), professional version $179.)

G.R. Brieger
Redmond, WA

Reply from Stoneware

Thank you for the opportunity to respond to the not-so-glowing review of Stoneware's Graphics Processing System.

Recently all reviews which have been published have been complimentary, so we're a little baffled as to your reviewer's perception of the product.

Let us elaborate on a few statements which were made: "GPS is to graphics what Word Star is to writing. . . ." That is an accurate analogy and Graphics Processing (not GPS, by the way) manipulates any object, independently of any other drawing on the screen, as one cell—much like a word processor would address one letter or word.

In addition, our program enables modification in seven different ways, or it can delete any object on the screen without having to redraw existing objects—much like making corrections on a word processor.

We have adopted the technology of CAD formerly only used in minicomputers. Rather than using the old-fashioned memory-intensive shape tables, we store images as vectors. One of the advantages of using vectors is that only two locations are stored—the start and the finish of each line. Another advantage is rotation. If you attempt to rotate an object stored in a shape table, it will redraw it larger than it really is. Therefore an entire architectural drawing can be drawn on screen and stored in as little as 1/10th the space normally required on an Apple disk for a normal 34-sectored shape table.

Throughout the Graphics Processing System manual it is stated that the system is not a free-hand drawing tool. Just as one would not use VisiCalc as a calculator, Graphics Processing System is not designed for an artist wishing to draw portraits, but for engineers, architects, art directors—anyone whose work involves graphics.

It is not necessary to buy a graphics tablet to use Graphics Processing System, but making original drawings would be much easier on an interactive graphics tablet or light pen; of course, a joystick is far easier to use than paddles when trying to plot the X-Y access simultaneously.

We are aware that the index was omitted from the manual. The new manual will contain one.

The keyboard was originally designed to input only text, we are inputting graphics. New technology will have little use for a keyboard, but will make use of graphics tablets, light pens, touch screens, mice, etc. Needless to say, any person whose expertise is in graphics would feel more comfortable inputting information in these forms than with the keyboard.

We're sorry that the reviewer's paddles are worn out, but hardware malfunctions should not be included in a software review. Also, back-up disks now accompany the system.

In conclusion, Graphics Processing System has enabled drafting professionals to buy a CAD system, complete with graphics tablet and plotter, for under $8000. For example, a year ago, an architect would have spent $40,000 and only received ten to 20 percent more features. Graphics Processing System retails for $179 for the Professional Version and $69 for the Standard (hobbyist) Version.

Michael Belling
President
Stoneware, Inc.

Real Estate Investor

Four VisiCalc templates Which let you use an IBM for investment forecasting

Real Estate Investor, from Simple Soft, is a set of four VisiCalc models which are designed to help you make residential and investment property decisions. A VisiCalc model, also called a "template," is an application program in which the author has done all the development work, specified the equations and set up the screens for you. All you have to do is fill in the blanks.

The templates are provided on a copyable disk, supported with an excellent manual complete with sample output and input screens, and are geared to the computer novice. There is even an appendix on how to operate VisiCalc, directions on how to move the cursor and step-by-step instructions on how to print out the reports generated from the analyses.

The disk provides the would-be investor with two models: one for single-unit dwellings like houses, and another for rental buildings or what is commonly called "income property." Let's take a look at how the models work.

Family Residence Analysis

You're battered by inflation, a terrible recession and frightened by the unemployment rate. Yet, you and your spouse keep eyeing that new contemporary being built back in the woods. Could you afford it?

You first load VisiCalc (the documentation doesn't say whether Real Estate Investor requires either version 1.0 or 1.1 of VisiCalc, so I tested under 1.1), and load the model INDVDUAL.VC just like any other VisiCalc file. From here on in, it's only a matter of substituting your numbers, assumptions and guesses into the spaces provided.

Enter the expected purchase price of the dwelling, plus any contemplated first-year improvements. Next, enter the planned mortgage amount, interest rate, starting year, ending year and any possible balloon payment.

The model allows for a first and second mortgage, as well as for a loan. Percents, by the way, are sometimes entered as ".07" and sometimes as "7"—sloppy. Certain fields, such as in the second mortgage, cannot be left blank or the model will crash, even if the second mortgage is not used.

After entering mortgage information, enter contemplated bank charges, closing costs and legal fees, as well as your regular tax rate and the capital gains exclusion. If you don't know what that is, or

"It was designed with the small businessman in mind."

how much of your capital gains can be excluded (for instance, by selling one house and buying another), the documentation tells you to consult an accountant. Generally, though, you'll be able to exclude at least 60 percent, and sometimes 100 percent, of any gains when you sell the residence.

After entering some other information, the model requests a housing budget for items like gas, electricity and real estate taxes, complete with your estimates of how much these will inflate each year.

Then, you enter other debts you have, like auto payments (only two lines are provided for this) and your gross monthly income. Finally, you get to pick either a percentage increase or a fixed amount which you think you could sell the house at in the future. After entering these items, the model is ready to go to work.

The model requires manual recalculation in VisiCalc and requires it five times. That means you have to press the exclamation point five times before the model has your output together. You will receive a nicely formatted four-page report containing your input and a relatively complete analysis of the financial consequences of the purchase.

The manual gives specific printing instructions for getting a hard copy of the report. The tutorial is detailed enough to let you understand and interpret the results provided.

When I used the INDVDUAL.VC model, it performed flawlessly and quickly (loading time about 1.5 minutes; analysis time about 30 minutes; printing about three minutes) on the sample data included in the model.

However, when I entered some data of my own using larger numbers, the model would not compute an internal rate of return for my application, but returned N/A (not available in VisiCalc-ese). When I tried some other numbers, the model worked fine. Whether there is a computational shortcoming in the model, a negative interaction between revision 1.1 of VC and the model, or something else isn't clear. However, the model just would not provide that IRR calculation!

The Income Property Models

The models for income property analysis include three stand-alone VisiCalc files—Income, which is similar, but much more complex than the individual model discussed above; an Income Schedule model, which tracks apartment rentals, parking, laundry and other revenues; and an Expense Schedule model, which keeps track of where the money goes. I did not test these models extensively, except to verify that they work in a plausible fashion when simulated data is input.

A chapter in the manual contains a good discussion of various mortgage and other financing instruments. It also discusses how to make assumptions among the array of alternatives open to the homeowner or investor.

Conventional, assumed, balloon and variable rate mortgages are all discussed and the authors do a good job of showing both how to use the models with these various alternatives, and how to run analyses which clarify some of the details of the more complicated ones.

Evaluation

Real Estate Investor is a sophisticated package which can be valuable to the individual home-buyer and, especially, to the income property investor. The package is professionally done, appears sound in terms of computations/equations (but I can't vouch for that beyond the model's responses to plausible inputs) and has a professional manual. A lot of analytical power is provided here; however, some aspects of this package trouble me.

For one, Real Estate Investor is a dedicated set of templates which make VisiCalc more useful, but it contains nothing you couldn't do yourself. But, if you're not inclined to play around with the machine that much and you need certain kinds of real-property-investment information, this package can be a good buy.

Another "use flaw" is that a large proportion of both family-residence and income investors have something to get rid of at the same time they wish to acquire a house or other property. There is no reason why you couldn't use Real Estate Investor twice for such applications—once to appraise the effects of selling the old house and again to look at the economics of buying the new one.

I would have appreciated a model in which existing property and contemplated acquisitions could have been compared against one another on a single spreadsheet.

Finally, and as the authors themselves point out, the real glitch in models of this sort is that they are dependent on your assumptions about the future. Who knows how much you're going to be able to sell that house for in ten years?

Who even knows what will happen to natural gas prices or to your own income in the next year? The key to properly using a model like Real Estate Investor is to run a number of analyses using different assumptions (sensitivity analysis) in order to determine how sensitive the results are to changes in your guesses. Unless you're willing to do this, and it's very tempting to minimize your time at the machine by just running things once, you're just as likely to misinform yourself as you are to improve your investment decisions. Real Estate Investor requires an IBM Personal Computer with 64K, one disk drive, VisiCalc and an 80-column printer (optional). (*Simple Soft, Inc., 480 Eagle Drive, Suite 101, Elk Grove, IL 60007. $129.95.)*

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VIC-20 Machine-Language Programming

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Forecasting Real Estate Investments

VICMON

A machine-language Monitor for The VIC-20

VICMON is a VIC-20 accessory cartridge available from Commodore. It is designed to make it easier to use machine language on the VIC-20 and is intended to create programs that run faster than Basic programs for intensive computing jobs like complicated graphics, fast-paced games or real-time control applications. It is valuable if you want to learn how things really happen inside the machine.

On the VIC-20, the Basic language is in a specially privileged position. Because there is a Basic language system preprogrammed into the standard VIC's ROM, when you turn the machine on, there Basic is, talking to you. Although it's possible to do just about everything that can be done on the VIC-20 using Basic, the Basic way isn't often the best or easiest way—it certainly won't be the fastest.

Even a simple Basic program burns up a good deal of processor time with "overhead," because the Basic interpreter must do many things that are not directly required by the job at hand, like translating commands and making elaborate provisions for memory management. This makes for slow-running programs.

Programming directly in machine language "cuts out the middleman" and can make it practical for a little computer like the VIC to do bigger jobs much faster than when Basic is in control. But nothing is provided in the VIC to make this easy. Without the VICMON, your easiest options for machine-language programming are to enter programs laboriously using Basic to get access to the memory locations, or to use an assembler program purchased on a cassette.

Machines larger than the VIC often have at least a primitive machine-language monitor available in the ROMs. VIC's designers probably figured most users of a low-end system wouldn't need such a thing, so it could be left out in favor of other features. But for those of us who are interested, they have provided a good equivalent in the VICMON cartridge accessory.

VICMON's Capabilities

The VICMON cartridge plugs into the memory expansion slot in the back of the VIC, like Commodore's game cartridges and the Programmer's Aid cartridge. It contains ROM chips holding programs for useful utility commands for machine-language programming.

A major convenience of a monitor is its capability to inspect the contents of memory locations and change those contents if desired. This is provided for in the VICMON program with a command that allows the contents of memory to be displayed in hexadecimal format.

It is easy to change the contents of any memory cell shown in the display. To change a memory register, the cursor is simply moved to the right place on the screen. Whatever you type in hexadecimal will be written over the old contents of memory. There is also a command to display (but not modify) ASCII characters in memory.

Other important features of VICMON are for program entry and debugging. There is an assembler of sorts provided as a command. Enter one or more lines of machine-language mnemonics and operands in hexadecimal format, and the cartridge's programs will translate the mnemonic into an op-code, do any necessary translation on the operands (saving you from minor headaches like computing relative branch values), and enter the results in the specified place in memory.

The main difference between this assembler and an ordinary assembler is that you may not use symbols for operands, so you must take a little more of the responsibility for planning memory use. Also, you may not change things quite as easily as with a symbolic assembler.

VICMON provides commands that take this shortcoming less seriously. A memory-move command allows you to shift your program to a different place in memory and another command goes through the moved program and updates operand addresses, reflecting that the operands pointed to may have moved when the program was moved.

There is also a command to search through memory for a particular sequence of bytes. This is useful for finding all the places in a program where a particular operand occurs.

So much for translation from human-readable assembler format into a machine-runnable program. What about the reverse? There is also a disassembler command provided. You simply point it to a place in memory and it tells you how this would be executed as a machine-language program, showing mnemonics instead of op-codes and operands. This is essential for checking back and changing your machine-language programs.

If you press a cursor key, the display scrolls forward or backward through any size machine-language program. This is just the thing for investigating the mysteries of the ROMs containing the operating system and Basic.

When you are through assembling and are ready to test, there is (naturally) a command to pass control of the computer to your routines (like SYS in Basic). Control is returned to the monitor when the machine executes a BRK instruction in your program. But for those of us whose programs are not guaranteed to work the first time, there are a couple of more conservative options.

At the most cautious end of the scale, there is a command to "walk" through your program one instruction at a time. By repeatedly pressing a key, you get to see disassembled lines of your program on the screen before they are executed. You can stop at any time and display the contents of the processor registers or

(continued on p. 174)

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